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VICTOR CLARENCE VAUGHAN*

PHYSICIAN, educator, biochemist, hygienist, patriot. Born at Mount Airy, Randolph County, Missouri, October 27, 1851; died at his home in Richmond, Virginia, November 21, 1929.

Victor Vaughan first emerged from the obscurity of youth and adolescence at the age of nineteen as professor of Latin at Mount Pleasant College, Huntsville, Missouri. In his earlier years he had been tutored by a man whose first love was Latin and who so drilled this dead language into the young boy that the two of them were able and accustomed to carry on their daily conversations in Latin. It was but natural then, that immediately upon his graduation from Mount Pleasant College, he should devote his energies to that subject in which he was most proficient. But for a man whose subsequent life has proved him to be an indefatigable searcher for the truth in the great unknown realms of science, the teaching of a dead language could scarcely be expected to become his permanent metier.

He discovered the latter quite by accident. In an unused room in Mount Pleasant College which had been closed through the Civil War, Victor Vaughan discovered a number of unopened packing cases which on investigation proved to contain a complete outfit for a chemical laboratory. Obtaining permission to set up the laboratory, and to experiment with the various chemicals, he soon became fascinated with the work and within a short time was teaching chemistry along with his Latin. Throughout the remainder of his life the viewpoint of the chemist dominated his contributions to research.

In 1874 he entered the University of Michigan to pursue his chemical studies, and a year later added the degree of M.S. to that of B.S. obtained in Missouri. In 1876 he received the degree of Doctor of Philosophy, and two years later that of Doctor of Medicine. In 1897 he was made an honorary Doctor of Science by the University of Western Pennsylvania. Four times he received the honor of the degree of Doctor of Laws, the highest honor

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that can be conferred by an institution of higher learning. He received this degree from the University of Michigan in 1900, Central College, Missouri, in 1910, Jefferson Medical College, Philadelphia, in 1915, and from the University of Missouri in 1923. An unusual honor was the conferring on him of the honorary degree of Doctor of Medicine by the University of Illinois in 1894.

Dr. Vaughan's first contribution from the chemical laboratories of the University of Michigan, appearing in 1875, was on the separation of arsenic from other metals. Throughout the succeeding fifty years the study of organic and inorganic poisons held greatest interest for him, and his contributions to the subject have been authoritative. Before long he was recognized as one of the leading toxicologists of the country, and his services were in constant demand in cases of medico-legal dispute.

As early as 1875 Dr. Vaughan became associated with the Medical School of the University of Michigan as instructor in medical chemistry. In 1878 he published his second book, a textbook of physiologic chemistry which went through three editions in as many years. In 1880 he was made assistant professor, and in 1883 professor of physiologic and pathologic chemistry and associate professor of therapeutics and materia media in the Medical School of the University of Michigan.

During these years Dr. Vaughan's research work paralleled quite closely the line of his teaching work. He continued always interested primarily in the chemical causes of disease and the changes in the human body consequent on contact with these causes.

In 1880 he became interested in the contamination of drinking water, and this eventually led him into the field of public health. The inadequate and unsanitary facilities for obtaining drinking water at that time rendered the question of pollution most important. In those days the only method of examination was chemical, and gradually the function of examining water supplies from all over the state of Michigan fell to Dr. Vaughan. He soon saw that this was but a very small portion of the general problem of sanitation and his interest in this field gradually broadened. In 1886 he wrote the Lomb prize essay of the American Public Health Association entitled *Healthy Homes and Foods for the Working Classes*, which went through many editions and was translated into most of the modern languages. In 1883 he was appointed a member of the Michigan State Board of Health, and for the following thirty-six years he served as its president, until 1919 when the board was disbanded and replaced by a commissioner of health.

During his first fifteen years at Ann Arbor, Dr. Vaughan carried on his investigations in the chemical laboratory. However, it gradually became apparent that the old chemical laboratory was inadequate for pursuing problems relating to health and disease. He therefore sought and obtained a grant from the Michigan legislature in 1887 with which to build and equip a hygienic laboratory at the University. At the same time he was made professor of hygiene and physiological chemistry and director of the hygienic laboratory. These positions he retained until his retirement from the university.

At this time the newly developing science of bacteriology was the great advance of the day. Although Pasteur had laid the foundations some years

before, and Robert Koch had demonstrated that the anthrax bacillus is the cause of anthrax, the birth of the science of bacteriology dates from 1882, when Koch developed methods for isolating bacteria. In 1887 when the hygienic laboratory was being built, bacteriology was but five years old and there were no trained bacteriologists in this country. In 1888 Dr. Vaughan therefore spent some time in the laboratory of Dr. Robert Koch in Berlin, gaining an understanding and mastery of this new science. Immediately upon his return this work was introduced into the hygienic laboratory. This was the first laboratory in the United States offering systematic teaching of bacteriology to students and physicians, and the second in the world.

As a consequence of his rapidly developing preeminence in the fields of hygiene and sanitation and toxicology, Dr. Vaughan was offered in the nineties the professorship of hygiene at Bellevue Medical College, New York, together with the position of coroner for the city of New York. These honors, however, he declined, feeling that he could never be happy living in the great city. At about this time he was made Dean of the Department of Medicine and Surgery at the University of Michigan, a position which he held for thirty years, until his retirement in 1921. Under his direction the school grew steadily until it became one of the greatest medical schools in the United States. He gathered around himself a faculty of the best minds in medicine, and as rapidly as another great medical school would take away individual members for its own faculty, he would replace them with other men of equal brilliance.

From the time of his tutelage under Robert Koch, Dr. Vaughan's first interest in the research laboratory remained always the mechanism by which bacteria cause disease and the manner in which the living body combats bacterial infection. This was but a logical step from the study of the chemical causation of disease, and throughout the remainder of his work his viewpoint, even in the field of bacteriology, was that of a chemist. This is in evidence even in the last essay which he wrote, *A Chemical Concept of the Origin and Development of Life*, in 1927. Dr. Vaughan has with entire justice been called one of the founders in this country of the modern science of biochemistry, or the chemistry of life.

His contributions to medical literature are too numerous to detail, being represented by about two hundred and fifty short articles and seventeen books, some of which have gone through several editions. Among the outstanding contributions emanating from his laboratory may be mentioned *The Michigan Method of Water Analysis;* the discovery of tyrotoxicon or cheese poisoning; the demonstration that a variety of bacteria may be responsible for the summer diarrheas of infancy; the discovery that nuclein, a constituent of normal blood, possesses germicidal properties; and chemical researches into the nature of bacteria and their reaction with living tissues which culminated in Vaughan's theory of infection and immunity, a theory which today still colors most of our understanding of these processes.

In 1898 Dr. Vaughan joined the Thirty-Third Michigan Volunteer Infantry as major and surgeon and served through the Spanish-American War as division surgeon. He was the first surgeon to come under the fire of the Spanish batteries at the Battle of Santiago. While in Cuba he contracted

yellow fever, and after a prolonged convalescence, he was invalided home to Washington. Here he, Major Walter Reed, and Major Edward Shakespeare were appointed as a commission to study typhoid fever among the Spanish War troops. This committee made revolutionary observations on the nature and manner of the spread of typhoid. Reed and Shakespeare having died, it fell upon Major Vaughan to complete the work and write the report. This he did in a massive two-volume contribution which stands today as one of the most authoritative works on the epidemiology of typhoid and kindred diseases.

From the time of the Spanish-American War until his retirement, Dr. Vaughan remained in close contact with the army and the United States Public Health Service, serving on the advisory board of the Surgeon-General of the United States Public Health Service, and on the advisory board of the Hygienic Laboratory at Washington.

In September, 1916, many months before the entrance of the United States into the World War, the National Research Council was organized as a committee from the National Academy of Science, to serve the president of the United States in an advisory capacity in preparation for war. Dr. Vaughan, who was one of the organizers of this committee, served with it throughout the war, and following its reorganization after peace, became the first chairman of the medical division of the National Research Council. This position, requiring full time, necessitated Dr. Vaughan severing his connection with the medical school of the University of Michigan and moving to Washington. Throughout the World War he served as colonel in charge of the Division of Communicable Diseases in the Surgeon-General's office, and on the executive committee of the general medical board of the Council of National Defense. By virtue of his position in the army, he was able to apply his wide knowledge of hygiene, sanitation, and epidemiology in the organization and supervision of the army training camps throughout the United States. Following the close of hostilities, he wrote a two-volume treatise on *Epidemiology and Public Health*, into which he has incorporated his own vast experience together with the experience of others.

As an editor he founded the *Physician and Surgeon*, in 1888, the JOURNAL OF LABORATORY AND CLINICAL MEDICINE, in 1915, and in 1923 served as the first editor of *Hygeia*, a popular journal published by the American Medical Association.

Dr. Vaughan served as president of the American Medical Association in 1914-15, and for many years remained a member of its Council on Medical Education. From 1919 to 1923 he was chairman of its Council on Health and Public Instruction. He was a member of the Association of American Physicians, being its president in 1908-9. He was president of the American Tuberculosis Association in 1919. He was also a member of the National Academy of Sciences, the American Philosophical Society, the French Society of Hygiene, the Hungarian Society of Hygiene, and other learned societies.

He served for several years on the board of directors of the International Health Board, which has done more than any other one organization to stamp out hookworm, malaria, and yellow fever from the Americas.

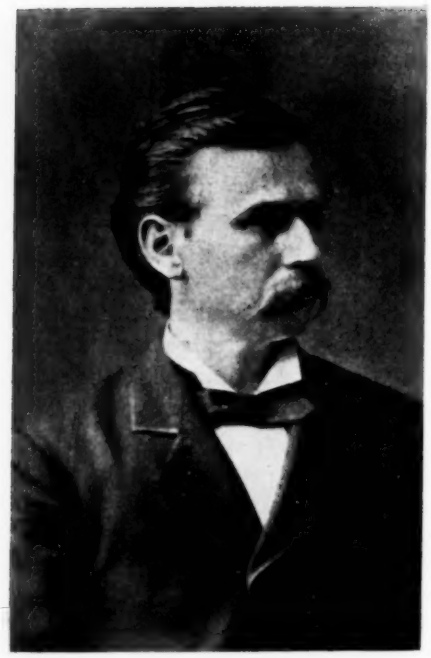
Following the Spanish-American War he received a citation for gallantry under fire, and following the World War he received the Distinguished Service Medal for his work in epidemiology, and was made a Knight of the Legion of Honor by the French government.

In 1928 he received the Kober Medal of the Association of American Physicians for outstanding contributions to his profession.

No biographic review of Dr. Vaughan's rich and varied life would be complete without some mention of his first twenty years as a physician, during which he devoted half of his time to the practice of medicine. It was what he saw and heard at the sick bed that filled him with a compassion and sympathy which lasted throughout his life, which won for him devoted friends and admirers throughout the world, and which spurred him on throughout his life in his battle against filth, poverty, and ignorance, against typhoid fever and tuberculosis, and against the germs of disease. Unlike many of the present-day research workers, he had seen on both sides of the curtain, he was able to work not only as a laboratory investigator interested in an abstract problem but also with the zeal of one who had witnessed human suffering and who hoped to do his bit toward ameliorating it. Fortunately, he has left in *A Doctor's Memories* a delightful narrative of his unique experiences and of his contacts with the great minds of his time, both in Europe and America.

In 1927, upon his return from the Orient where he had attended at Tokio a meeting of the Pan-Pacific Congress as a representative of the government of the United States, the National Research Council, and the American Medical Association, he suffered a mild apoplectic seizure from which he recovered, but which terminated his participation in active work.

—*Warren T. Vaughan.*



VICTOR C. VAUGHAN, PH.D.
Instructor in Urinary Analysis, 1877

A GREAT PIONEER PASSES*

AMERICAN science today mourns the passing of a great pioneer. When Dr. Victor Vaughan began scientific research, there were thousands of surgeons who thought Listerism a fad, and other thousands who doubted the whole germ theory enunciated by Pasteur. In medical education, standards were so low that a young man could register at almost any medical college if he could read and write, and he could "qualify" for his profession, with the title of doctor of medicine, after two years of training.

It was Dr. Vaughan's extraordinary fortune to contribute both to the new science and to the new medical education. At Ann Arbor he inaugurated the system of premedical training that has since been generally adopted. He insisted, also, that his students equip themselves with a background of cultural study, especially in languages. He built up the medical faculty of the University of Michigan on the solid foundation of brains, devoting all of his appropriations to the employment of outstanding men in their professions. He was shrewd enough to reason that if he brought great teachers to the school, the graduates would quickly see to it that adequate equipment was provided by the state.

In his own scientific work, Dr. Vaughan systematized the developing principles of epidemiology and helped create in this country the new science of physiological chemistry, which has now become biochemistry. His influence was as important as his discoveries. He sent out well-equipped investigators, a multitude of them, and he was in full fellowship with all that great company of scientists whose joint work in sanitation and hygiene has transformed American public health within the last thirty years.

Dr. Vaughan grew old as a scientist should—gradually abandoning research, but never losing interest, turning happily to past memories without permitting past achievements to overshadow recent advances. His *A Doctor's Memories* was a charming book, worthy to stand on the same shelf with such modern medical classics of biography as Wyeth's autobiography, Vallery-Radot's *Pasteur*, and Cushing's *Osler*. His lovable personality and his rare skill as a raconteur made it certain that wherever he sat was the head of the table. Brief as was his residence here in Richmond, he had the admiration of all who are wise enough to see in great scientists the prophets of a nobler, happier social order.

*An editorial in the Richmond (Virginia) *News Leader*, November 22, 1929.

At Budapest, 1914

VAUGHAN, THE MAN*

THE name of Vaughan, like that of Angell, has become a synonym for beloved traits of character, in this town.

They are traditions.

Great men, were those two. Great in the sense that they accomplished much and became famous through their endeavors, but even greater because in spite of those attainments their personalities were supremely human. There was a magic warmth in their very presence.

Angell joined the immortals long ago. Vaughan laid down life's burdens Thursday night in Virginia.

The former Michigan medical dean was nearly eighty years of age. It was a strenuous life he led, one that might have been calculated to shorten his span. It was strenuous in the sense that he was forever busy, rising at an early hour, putting in a day of work that was exceedingly full. But there was no nervous waste of energy.

Vaughan accomplished things quietly, without apparent strain. There was no lost motion; he had the capacity to do things without unnecessary exertion. Maybe that is one reason he lived so long.

But another reason must have been his human qualities. He could always take out time for communion with his friends. We have an idea that he may have been spared so long because he was so much beloved.

It may be fine to enjoy international renown as a scientist. It must be gratifying to have such accomplishments as those of Vaughan to one's credit. But in his *Memories* human beings and human relationships predominated. That is significant. It confirms the belief that his scientific brain, capacious as it undoubtedly was, could not compare in size with his human heart. Indeed, it was through love of humanity that he was devoted to science.

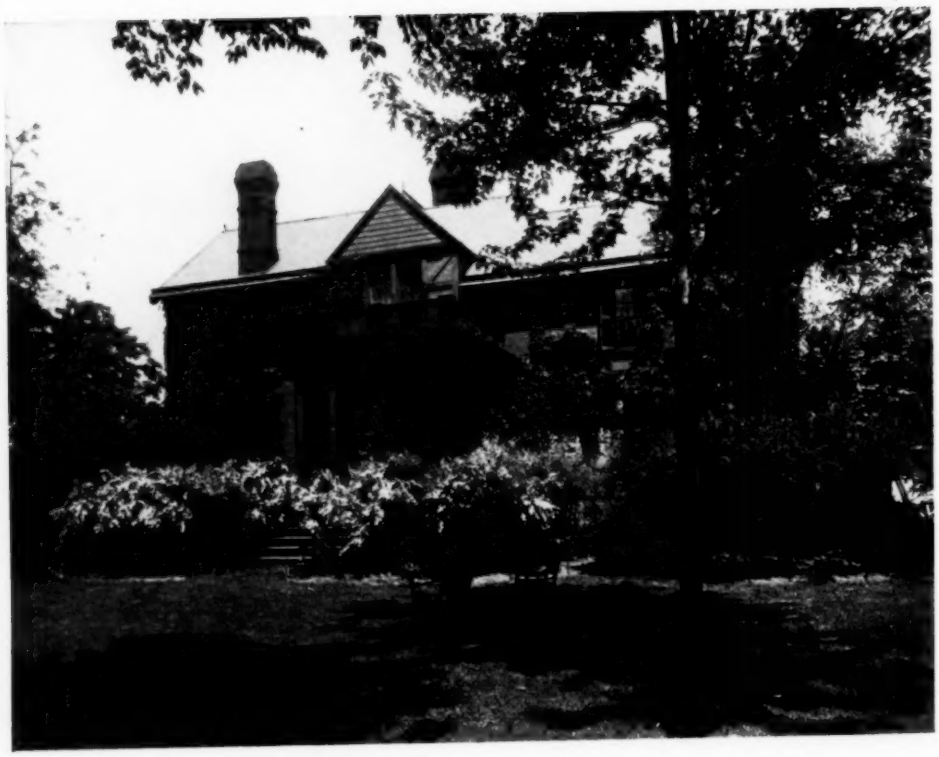
That heart beat for the University and for Ann Arbor. He had watched them both grow, was identified with that growth, and he loved their pasts, yet he was proud of the progress here, both on and off the campus. "Sentiment must not be permitted to interfere with progress," he told the writer not long ago, while discussing the changes here. He could take delight in the past while taking pride in the future.

Though he died the other day in Virginia, he still lives in Ann Arbor. He, like Angell, is one of the town's immortals.

The spirits of them both are living forces of inspiration.

Not because of what they did, but because they were the kind of men they were.

*An editorial in the Ann Arbor, (Michigan) *Daily News*, November 23, 1929.



The Ann Arbor Home

STANDARD BEARER

IN THE death of Dr. Victor C. Vaughan the medical profession lost one of its greatest teachers, and the public lost a friend who worked incessantly for the cure and prevention of disease.

As one of Dr. Vaughan's students in the early days, I perhaps can give a picture of the man, his ambitions, his influence as a teacher, and those personal attributes that so endeared him to his students and to all who came in contact with him.

Dr. Vaughan was a comparatively young man when he came to the Medical Department of the University of Michigan. He had been in Ann Arbor only a few years when I entered the medical school as a student. The chair of medicine was held by Dr. Alonzo B. Palmer. At that time Dr. Palmer was eighty years of age, and quite naturally it was Dr. Vaughan who carried the load of giving the students a modern view of medicine. Dr. Vaughan's outlook on medicine was a generation ahead of his time. He was one of the first to realize the influence that physics and chemistry were to have on medicine, and his students were well prepared for the great changes in the science and art of medicine which have come about in the present day. He aroused in his students an enthusiasm and a thirst for knowledge, and, beyond all, he inspired them with an interest in the tomorrow of medicine which, I may say, was the mainspring of his life.

Whereas Dr. Vaughan might have taken up clinical medicine, and made a great success in its practice, he chose to devote himself to preventive medicine. In the clinical work which he did undertake he showed great sagacity and the acumen of a fine practitioner of medicine. Although he was interested in the individual, in what might be called retail medicine, his heart was in the wholesale problems which affected the mass of the people.

Researches into public welfare always have been carried on by men like Dr. Vaughan, and too rarely do the people understand the significance of the work sufficiently well to give the reward where it is due. Fortunately, Dr. Vaughan's name and fame do not depend on popular acclaim. He lives rather in the minds and hearts of the medical profession. The members of this profession gave him the greatest gift within their power, the presidency of the American Medical Association. They also appointed him to responsible positions which had to do with the solution of problems of public health and the adaptation of health measures to the needs of the people.

The value of Dr. Vaughan's work during the World War cannot be overestimated. Owing to the inadequate sanitation of the hastily constructed military camps, and the hurriedly mobilized medical personnel, untrained for their duties in military service, epidemics of disease were appalling. Dr. Vaughan, in the office of the surgeon general, rendered invaluable service in the work of stemming disease and bringing about better organization of the medical personnel and of the newly enlisted men in camps. Many times I heard Surgeon-

General Gorgas speak gratefully of Dr. Vaughan and his associates who so willingly and wholeheartedly gave their time and effort to support the work in the office of the surgeon general.

I came to know Dr. Vaughan well in those years in medical school. I knew him in his home, in his laboratory, and in his contacts with the sick; and I had the pleasure and profit of close association with him during all the years that followed. It may seem strange that a surgeon and a medical scientist should have had so much in common, but the friendship which was engendered in that early day continued through life. His viewpoints were most stimulating, and his friendly interest matched my admiration for him and his work.

In penning these few words concerning my old teacher and friend, I wish to acknowledge the influence he had on my professional life and which he had on the lives of hundreds of medical students in the years that have passed between. He not only helped the members of the medical profession to a keener sense of their professional responsibilities, to the individual patient and to sick human beings collectively, but he induced them to live up to a standard of ethics which he himself followed all his life.

—*W. J. Mayo,*
Rochester, Minn.

VICTOR CLARENCE VAUGHAN AND THE UNIVERSITY*

WE HAVE assembled today to commemorate the passing of a man whom it is altogether fitting we should honor—a man whom we knew and loved as a friend, and admired and respected as a colleague.

While as permanent, it is to be hoped, as any human institution and thus greater than any individual, the University is, nevertheless, molded by the strong and able men of broad vision on its faculties. It is doubtful if the impresses of the personalities of these men upon their institution will ever be erased and certainly it is earnestly to be hoped that they are indelible.

Who can doubt that Dr. Victor Clarence Vaughan, during the period of his active service at the University of Michigan, was a powerful factor for good in shaping its destinies? Others will today discuss his contributions to science and to the practice of medicine, and his relations with his colleagues. The high ideals of scholarship, the research ability, and the cooperative spirit which were his are all attributes of the successful professor.

In addition to these, however, Dr. Vaughan had to an enviable degree the characteristics which made him an administrator who could not only lead his school according to the best contemporary standards, but who could also anticipate future conditions and academic requirements in his chosen field, all without failing to observe the proper perspective of his unit to the parent institution. Thus it was that he was willing to give fully of his time and strength to the founding of the Graduate School, the Senate Council, the Board in Control of Athletics, and such organizations as the Scientific Club and the Research Club, and to the assistance of the Alumni Association. In short, while devoted to the development of the medical units, it was ever his governing conception that these units should not be built at the expense of other University departments, but that the University as a whole should be steadily developed to maintain the proper relation between the institution and an ever better school of medicine.

The University recognized Dr. Vaughan's ideals and ability in the way he would have preferred—by giving him constantly increasing responsibilities. It was characteristic of the man that he accepted these responsibilities, and labored diligently for the general good of the University and for the development of the Medical School, without neglecting to serve ably his community, state, and nation and to establish and maintain an enviable record as a teacher and investigator. His service was, therefore, the maximum one that a member of the staff can render and we need not point out in detail the evidence of his success as a university officer. Dr. Vaughan's monument is a Medical School

*Memorial Meeting for Doctor Victor C. Vaughan, at the Lydia Mendelssohn Theatre, Ann Arbor, December 3, 1929.

Courtesy of Wilfred B. Shaw, Director of Alumni Relations, University of Michigan.

which has few rivals for its output of scientific contributions and men of marked ability as scholars and practitioners, and the other flourishing departments which are in large measure the materialization of his dreams. We may pause to observe that the University as a whole is a better institution than it would have been without his assistance.

I have said in another place that the University is in a very real sense its faculty. "Buildings are needed, equipment is required, and funds for current expenses must be provided; but since these material requirements are worthless without men to use them, the effectiveness of the University may be said to be determined by the men who compose its faculties." In Dr. Vaughan's life we will have before us always a standard of merit for the appraisement of our value to the institution that we serve.

—*Alexander G. Ruthven,*
Ann Arbor, Mich.

REMARKS ON BEHALF OF THE BOARD OF REGENTS*

THERE is but one measure of greatness—the contribution that one makes to world betterment. To few is it given in both ability and opportunity to reach the summit, and merit the supreme reward. What the purpose of our living and striving may be is beyond our ken. It is sufficient that we play our part in the drama of progress, trusting to a wise Dictator of all things.

By this standard and conception, our beloved and departed friend has won a place in the seats of the mighty.

It was my good fortune to have known Dr. Vaughan as a teacher in my student days, and as an affectionate, helpful friend. He was a great inspiration to higher ideals—a leader and an originator.

Prophylactic medicine owes to him an immense debt. He early recognized the value of preventive measures and strove with all his rare talents to make them effective for mankind.

During his active life no great advance was made to which he was not an important contributor. The pioneer always travels an uphill road but, true to his convictions, he fought the battle, never daunted or discouraged. Fortunately he lived long enough to see many of his dreams come true and his judgments justified. This must have been a blessing in his declining years.

He early conceived the value of research and progress in the fundamental sciences and surrounded himself with a rare corps of coworkers who were without superiors.

As dean of a medical school situated in a small city where, in those days, variety of clinical material was wanting, he found it expedient and wise to build up and emphasize the laboratory or science courses in medicine to compensate for the deficiency in the medical arts or clinical courses. This was so well accomplished that he won distinction for his school and gave to it high standing.

No honor which medicine could confer was withheld from him. He was a world character because a world benefactor, and I have often said that a letter addressed to Dr. Victor C. Vaughan, without any other direction, and mailed from any part of the globe, would reach him at Ann Arbor.

While, as students, we feared his courses, we knew that he was exacting of us no more than he demanded of himself, and we respected and loved him. No student of his ever left the University without admiration and affection for him. This must have been a source of much happiness to him.

I had the prized privilege of often being a guest in the home of Dr. and Mrs. Vaughan, where the whole atmosphere was that of culture, peace, and beauty. They were blessed with an unusual family of boys and the relationship between father and mother and sons was movingly intimate and sympa-

*Courtesy of Director of Alumni Relations, University of Michigan.

thetic; they shared a just pride in the achievements of one another, and all interests were mutual and affectionate.

As dean and administrator of the Medical School, he had the confidence of the Board of Regents. He possessed that quality which is so large a factor in successful administration: he knew men and could justly appraise their possibilities and futures. We trusted his judgment and always gave to him the full measure of support within our means. He was appreciative of this attitude and relationship and reasonable in his requests.

In 1921 he began to feel that his health would no longer allow him to carry the burden, and that younger shoulders must take the load. It was a difficult conclusion for him and for us, but we were forced to bow to nature's limitations.

He lives immortal in a world made better by his living and has joined the "choir invisible."

—*Walter H. Sawyer,*
Hillsdale, Mich.

DR. VAUGHAN'S INFLUENCE IN MEDICAL EDUCATION

DOCTOR VAUGHAN was connected with the University of Michigan for a period of forty-six years, a term of service which I believe has been exceeded only once. But this long service is not of itself the reason for thus honoring his memory. Rather, it is because of the high distinction which he attained in his profession, the enduring impress which he made on the Medical School and on the University as a whole. In honoring him the University but honors itself.

Great as was his interest in the scientific work which he conducted, it was no greater than his devotion to the advancement of the Medical School. Fortunate, indeed, was the University that his guiding hand was at the helm in the crucial period which marked the transition from the old to modern medicine. It has been truly said of him that he took a great part in making his *Alma Mater* one of the best known medical schools.

Medical education in this country has passed through a period of evolution from the old apprentice system or preceptorship, through the proprietary or didactic colleges—which, as A. Flexner once stated, multiplied by fission or by a process of spontaneous generation—to the University schools with scientific discipline as the corner stone.

In passing, it may be mentioned that in the Act of 1817, establishing the University of Michigania, one of the thirteen professorships contemplated was that of Medical Sciences. In the then existing state of knowledge it seemed to the founders that a faculty of one was sufficient to cover the entire field of medicine. There is no evidence that any one functioned in this position, but at least one instance of that kind is known—that of Nathan Smith who established the medical department at Dartmouth and who was himself for twelve years practically its entire faculty.

When the Medical School was opened in 1850, it had a faculty of five, of whom Douglas and Sager were men of scientific bent; and it was because of the influence of these men that the school early took on a scientific character. Unlike the proprietary schools of that period, the school was from the beginning an integral part of the University. In those days the term of instruction in the medical colleges of the country, almost without exception, extended over two terms of four months each. The new school began with a requirement of two years of six months each. The course of study was extended, in 1877, to two years of nine months, and in 1880 to three years which allowed a graded curriculum to be established.

In the decade which followed, the experimental sciences were rapidly developing, and it is at this point that Doctor Vaughan's influence began. After the death of Dean Palmer, in 1887, Doctor Ford succeeded to the deanship; but, because of his advanced age, the duties of that office were practically turned over to Doctor Vaughan who became officially dean in 1891. His

services during the transitional period of the school form the subject of this paper, for it was during that time that his great influence came into being.

It is indeed remarkable that practically without any other training than that which he had acquired at Michigan, he should have recognized the full import of the scientific development which was then taking place and of the need of full-time men in the medical sciences. To one who was steeped in chemical laboratory methods, it was perhaps but natural to wish that the newer sciences should find their places in the medical curriculum.

Through his work in physiological chemistry he was in touch with the progress in physiology, which was then looming strong on the horizon as a result of the work of such men as Claude Bernard, Ludwig, and Foster. And, when in 1881 the question arose of an independent chair in that subject, young as he was, he strongly urged and secured the appointment of Henry Sewall, who proved to be an inspiring teacher and an investigator of the first rank. While with the University his work on immunization against snake venom opened the path that led to the production of immunity against the soluble bacterial toxins. Upon the resignation of Doctor Sewall, because of ill health, a successor had to be found, and Doctor Vaughan was fortunate in securing Doctor W. H. Howell, who, however, was soon called to Harvard and then to the newly organized Johns Hopkins Medical School. He in turn was followed, in 1892, by Doctor W. P. Lombard, who remained on the faculty until after the retirement of Doctor Vaughan.

When Dr. Howell came to the University, he was nominally given charge of histology; but the real conduct of that department fell to Doctor Huber who has ever since maintained the high tradition of thorough laboratory work and productive research.

In the eighties the time-honored didactic teaching of materia medica was giving way to the new science of pharmacology. Doctor Vaughan's search for a thoroughly trained laboratory man resulted, in 1890, in the selection of John J. Abel as the first professor of pharmacology. Dr. Abel was a graduate of the University and had had years of training abroad and was therefore preeminently fitted for the new task. His fitness was such that upon the organization of the Johns Hopkins Medical School he was called and ever since has served there, enriching medicine by his masterful studies and deservedly acquiring the honor of being the foremost leader in his field. In 1893, his place was filled by the late A. R. Cushny who, like Abel, was a pupil of Schmiedeberg. Cushny remained here until 1905 when he was called to London University and later to Edinburgh. Since then the chair of pharmacology has been admirably filled by his pupil, Dr. Edmunds, whose contributions have added prestige to the department.

In 1889, Doctor Vaughan faced the necessity of finding four men to fill the recently vacated chairs. One of these vacancies was due to the retirement of Dr. Sewall, and the appointment of his successor, Dr. Howell, has already been mentioned. Another chair to be filled was that of general chemistry and the happy choice of Dr. Vaughan in selecting Dr. Paul C. Freer, a pupil of the renowned Adolf Bayer of Munich, gave to Michigan a man who

by his training and skill contributed to a marked extent to the development of chemistry in the University. His enduring monument was the establishment of the Bureau of Sciences in Manila whither he was called in 1901.

In a similar happy manner came the selection of Dr. de Nancrede as professor of surgery, and of Dr. Dock as professor of internal medicine. These men were in every sense full-time professors, for they devoted themselves unselfishly and whole-heartedly to the clinical work of the hospital. They were an inspiration to the students and were held in the deepest respect by their colleagues. Doctor Dock was called to Tulane University in 1908, and his place was ably filled by Dr. A. W. Hewlett until 1916 when he was called to Leland Stanford University. Dr. de Nancrede, ably assisted by his pupils, Darling and Loree, continued in service until his retirement.

When the chair of anatomy became vacant in 1894 by the death of that great and beloved teacher, Corydon L. Ford, it was filled, contrary to all previous practice, by a trained scientist, Dr. J. P. McMurrich, who demonstrated that anatomy could be taught by a biologist irrespective of the possession of a medical degree. His great ability as a teacher and scientist was such that before long he was called to the chair of anatomy at Toronto University. He was followed in 1907 by Dr. George L. Streeter who in turn was called away in 1914 to the Carnegie Institute.

When the chair in pathology was vacated in 1895, Dr. Dock became the nominal head; but the actual work devolved upon Dr. Warthin who since then has developed a department second to none.

Several years before Dr. Dock left the University, his pupil, Dr. Cowie, had already taken charge of pediatrics and in this field, by his ability and productiveness, he has achieved signal success.

On the resignation of Dr. Martin, in 1901, his place was filled by our honored colleague, Dr. Reuben Peterson. Similarly, the withdrawal of Dr. Carrow, in 1904, was followed by the appointment of Drs. Canfield and Parker who have earned well-deserved recognition.

The psychopathic hospital owes its existence to the wisdom and efforts of Dr. Herdman. At his death in 1906, he was succeeded by Dr. Barrett who, by his devotion to the work, has made his department a model for others to follow. Subsequently, the chair was divided and the chair of neurology was given to Dr. Camp.

The vacancy resulting by the resignation of Dr. Breakey in 1912 was filled by Dr. Wile who by his contributions in his specialty has won the admiration of the profession.

I realize that the foregoing is but an inadequate expression of the efforts made by Dean Vaughan to gather a strong faculty. With unalloyed pride he often alluded to his share in this work.

The selection of the men I have mentioned during the crucial period of the eighties and nineties and in the years immediately following gave the medical school a commanding rank. There were, however, other conditions which had to be met. The three-year course which had been in effect since

1880 was no longer adequate. In 1890 it was extended to four years in order to provide the fullest measure of scientific training with special emphasis placed upon laboratory instruction in the medical sciences. The laboratory method was extended to the clinical subjects by the organization of demonstration courses which aimed to impart to the student in the clinical years the same type of training as that which he had received in the fundamental sciences.

Dr. Vaughan realized that another step had to be taken to improve medical education and that was to increase the entrance requirements not for the purpose of reducing the number of students but rather to prepare them better for the work in medicine. The efforts of the best faculty would be largely misspent if the students were not adequately prepared. In 1890 a diploma from an approved high school was sufficient to meet the entrance requirements but in 1892, in addition, certain prescribed subjects, such as algebra, geometry, chemistry, physics, botany and zoology, were demanded and to these somewhat later trigonometry and a modern language were added. This progressive increase in the requirements finally culminated in 1909 in two years or sixty hours of collegiate work, including prescribed work in the languages and sciences. The number of hours required for entrance was eventually increased to seventy hours, or two and a half years of collegiate work.

Another significant step due to the initiative of Dr. Vaughan was the early establishment of the Combined Course. By arrangement with the Literary Faculty in 1892 students were permitted to register in the Medical School at the close of the third year and were given their bachelor's degree upon the completion of the first year in medicine. Eventually this arrangement was modified so that a student desirous of obtaining the two degrees could shorten the time from eight years to seven years for the A.B. degree and to six and a half years for the B.S. degree. By this arrangement the Medical School sacrificed nothing since the Literary College merely gave credit to which any student would be entitled if he elected such courses. The combined course eventually was adopted by many other universities.

The graduate work in the Medical School was encouraged in every way by Dr. Vaughan. As soon as he became dean, he obtained permission from the Board of Regents to enroll physicians and others in the various laboratory courses on the payment of a small fee.

Every effort was made by Dean Vaughan to provide his faculty with the best possible facilities for their work and in this he was highly successful. Funds were not plentiful but they were wisely used, and the results accomplished in these early years bore eloquent testimony to his foresight in the selection of his faculty.

Dr. Vaughan's service did not end with providing laboratory and clinical facilities. He knew from his personal experience that a good working library was a necessary part of the Medical School and very early in his career took an active part in creating the splendid Medical Library which the University possesses. Knowing as he did that the original sources were of the first importance, he saw to it that the library acquired complete sets of scientific

periodicals rather than a collection of textbooks. What he did in this direction was to him always a source of great pride.

The need of new hospital facilities was long evident. The old wooden pavilion hospital on the campus was to him a disgrace which had to be remedied. With that in view he appeared before the Legislature in 1889 and secured an appropriation of one hundred thousand dollars with which a new hospital was built. This was repeatedly enlarged, but by 1915 it was evident that a modern building was needed. The Legislature was again responsive and though the funds at first granted were inadequate the construction work on the splendid new hospital was well under way at the time of his retirement.

The medical laboratories in the nineties were largely in the old medical building which was erected in 1850. They were cramped and utterly inadequate. To remedy this condition Dr. Vaughan secured from the Board of Regents a modest appropriation with which the present West Medical Building was erected in 1903.

Dr. Vaughan's investigations began in the old chemical laboratory. By 1887 it was apparent that the quarters were inadequate for pursuing the problems pertaining to health and disease which were claiming his attention. His broad vision indicated the need of a separate institution. Accordingly, with the cooperation of the State Board of Health, the Legislature of 1887 was memorialized to establish a State Hygienic Laboratory at the University. The object of this laboratory, as stated at the time, was, first, to study the causation of disease; second, to make analyses of food and drinking water, and, third, to teach the causes of disease. The request was granted and an appropriation of forty thousand dollars was made for the erection of a building to be used jointly by the Department of Physics and the Hygienic Laboratory. At this time some attempts were made in the old laboratory to apply the new science of bacteriology to the solution of problems arising in connection with the examination of waters, but it was seen that a thorough training in the new discipline was necessary. At that early period this could only be obtained in Germany. Accordingly, Dr. Vaughan spent the summer of 1888 in Koch's laboratory in Berlin, where under the direction of Carl Fraenkel a first-hand knowledge of the new methods was acquired.

The Hygienic Laboratory at the University was completed in the fall of that year, and it was opened for work in January, 1889. It was the first laboratory in this country which offered systematic teaching of bacteriology to physicians and students. Before long the laboratory outgrew its quarters and in 1903 it was moved to the new, the present West Medical Building and since 1926 it occupies a wing in the East Medical Building. For twenty years after the opening of the laboratory Dr. Vaughan was active as its director, and it was during this period that a further and important step in extending its service to the state took place. In 1903, on the occasion of the first serious outbreak of rabies in the state, Dr. Vaughan obtained from the Board of Regents authorization to establish a Pasteur Institute as a part of the Hygienic Laboratory. At that time the antirabic treatment was not given except in two or three places in this country. Undoubtedly many lives have been saved through his wise foresight.

Apart from the Medical School Dr. Vaughan exerted a lasting influence on medical education in the country at large. He was an active participant in medical meetings and gave generously of his time and energy to promote medical education. His services were constantly in demand. He was a member of the Council on Medical Education from 1904 to 1913, and was Chairman of the Council on Health and Public Instruction from 1919 to 1923 and the last year in this capacity he devoted as editor to the newly-established journal, *Hygeia*. For several years he was Chairman of the Medical Division of the National Research Council.

I must forego even an enumeration of his many activities in promoting medical education at large. He was recognized as a great leader, a constructive thinker, and a broad idealist. By his students he was beloved and respected and to his colleagues who knew him best he was a man—honest, upright, and sincere, whose every effort had as its objective the good of the University which he loved as long as he lived.

—Frederick G. Novy,
Ann Arbor.

DOCTOR VAUGHAN'S WORK IN MEDICAL CHEMISTRY*

DOCTOR VAUGHAN came to Ann Arbor in 1874, entering at once upon the study of chemistry. His student days fell in that period when the opinion still prevailed that "the medical department in Ann Arbor consisted of a chemical laboratory with a medical school attached to it." Our early chemistry teachers—Douglas, Prescott, Rose, Langley—were all graduates in medicine. Naturally, the practical phase of chemistry was receiving at that time by far the major attention in our laboratory—the analysis of plants and foods, of drugs and poisons.

Presumably, because of this intimate connection between the Medical Department and chemistry, Vaughan, the young assistant in the chemical laboratory, after completing in 1876 the work for the Ph.D. degree, took up the study of medicine. Two years later he graduated from that department. For the next six years his duties were divided between the Chemistry Department and the Medical School, but even after his appointment, 1883, to a full professorship in the Medical School, his working quarters remained in the Chemistry Building. In fact it was not until 1889 that Dr. Vaughan moved into the newly equipped Laboratory of Hygiene and Bacteriology, which occupied the third floor of what is at present known on the campus as the West Physics Building.

Thus fifteen years of his early active life—1874 to 1889—were spent in the old chemical laboratory, with chemists as associates. It was in this building, in a small, crowded room on the second floor, in a room provided with only one window, that his first fundamental researches were done on the separation and identification of inorganic and organic poisons. These researches attracted wide attention, and placed him at once among the leading authorities in toxicology, a position which he retained to the end of his life. Here, in this cramped space, were initiated the studies on the contamination of drinking waters, and the results of these studies proved of inestimable value to many communities throughout the State of Michigan. Here, also, was commenced the important investigation that attracted so much attention in its day, namely, the investigation concerning the occurrence and the chemical composition of the poisonous constituent that is formed in cheese, milk, and cream, and to which Dr. Vaughan gave the name "tyrotoxicon."

The beginnings of his extensive literary labors were also started while he was still in the old chemical laboratory. In addition to a large number of smaller publications in medical journals, he published texts on physiology, pathology, and materia medica, and in each instance the chemical viewpoint was emphasized. One text was entitled *Chemical Physiology and Pathology*, and went through three editions in two years, 1878-1880. The treatise entitled "Ptomains and Leucomains, or the Chemical Factors in the Causation of Disease" (by Vaughan and Novy) went through four editions.

*Courtesy of Wilfred B. Shaw, Director of Alumni Relations, University of Michigan.

After removal to the new Hygiene Laboratory, in 1889, bacteriology, then a comparatively new science, engrossed his major interests. Here for fourteen years, and for almost twenty years longer in the West Medical Building, were accomplished a series of investigations that stamped Dr. Vaughan's laboratory as the most productive place on our campus. A large number of graduate students were attracted, and the influence that emanated from that laboratory proved of the greatest value for the growth of graduate work in every other department of the University. It became definitely understood on our campus that in the Medical Department the policy was well defined: teaching and research must go hand in hand.

But while, in the new Hygiene Laboratories, bacteriologic problems were the main focus of attention, the chemical aspect was never left out, and this imparted to Dr. Vaughan's investigations a feature which differentiated them in a striking manner from work along similar lines in other institutions. In his studies on the germicidal action of serum, in the investigations of the bacterial poisons and of the poisons from natural proteins, in questions of immunity and of sensitization—in the pursuit of all these problems he was both bacteriologist and chemist.

His work became highly regarded by the chemical profession, not only because of the intrinsic value of the specific contributions themselves, but also because these contributions emphasized strikingly the important services of chemistry in the solution of medical problems. Indeed, as far back as 1891, he defined his views in this respect in a paper published in the medical journals and entitled: "The Growing Importance of Chemical Studies in Medical Education and in Medical Research." By precept and by example he preached this doctrine throughout the succeeding thirty years of his deanship.

In common with other students of biology, gifted with active mind and vivid imagination, how could Dr. Vaughan have evaded the insistent question —what is the origin of life? Having to deal daily as he did with the lowest forms of things living, so small as to be filterable through porcelain, so low in the scale of life as to be nonvisible even through the most powerful microscope, it was not possible to avoid the query—where is the line of demarcation between inanimate and animate matter? What is the mysterious force that causes the conversion of the former into the latter? This inscrutable problem had an irresistible fascination for him. And when, two years ago, the American Chemical Society invited Dr. Vaughan to deliver the principal address at the Society's annual meeting, the address bore the significant title: "A Chemical Concept of the Origin and Development of Life." One is not called upon necessarily to agree with the hypothesis therein developed so plausibly and even brilliantly. No one, however, can read that paper without becoming deeply impressed by the writer's extraordinarily wide knowledge of the most recent developments in every branch of science, and by his keen powers of analysis and synthesis.

For one who has had the good fortune to know Dr. Vaughan personally, it is impossible to speak of him in the merely abstract manner, to speak of his having been a very eminent man in the science of medicine, in medical educa-

tion, in chemistry. He was all that—and very much more. His warm and impulsive, always generous, personality has been a most potent factor in the life of the University. He had a sympathetic interest for, and quite an intimate knowledge of, scholarly and creative work by the members of all the various faculties of our University. He gave friendly and inspiring encouragement to many and many a struggling beginner. He rejoiced in the achievements of others. We have all known him as a truly great man, and also as a generous and good man. We shall revere his memory.

—Moses Gomberg,
Ann Arbor, Mich.

Colonel Vaughan, 1919

VICTOR CLARENCE VAUGHAN AS A BIOCHEMIST

ALTHOUGH the enviable reputation of Dr. Victor C. Vaughan is dependent largely upon his scientific contribution to bacteriology and public health, and to the fact that as dean he developed one of the great medical schools of this country in a small middle western town, his first interest in science came to him through chemistry and throughout his life he held the point of view of a chemist in the many problems he undertook. As is so often the case, his interest was turned to chemistry quite accidentally.

After graduation from Mt. Pleasant College in 1872 he was appointed professor of Latin. In an unused room in the college, which had been closed during the Civil War, Victor Vaughan discovered a number of unopened packing cases which on investigation proved to contain a complete outfit for a chemical laboratory. Obtaining permission to set up a laboratory, and to experiment with the various chemicals, he soon became fascinated with the work and within a short time was teaching chemistry along with his Latin.

In 1874, he entered the University of Michigan to pursue graduate work in chemistry, receiving the M.S. degree in 1875 and the Ph.D. degree in 1876. After two years' further study he received the degree of M.D. As early as 1875 Dr. Vaughan began to take part in the teaching in the medical school as instructor in medical chemistry. He was made lecturer in 1879 and assistant professor in 1880. In 1883, he was promoted to a full professorship with the title of professor of physiological and pathological chemistry. For fifteen years (1874-1889) Dr. Vaughan carried out his researches in the chemical laboratory. In 1887, after the construction of the Hygienic Laboratory was authorized, his title was changed to that of professor of hygiene and physiological chemistry and director of the hygienic laboratory, a title which he retained until his retirement in 1921.

Dr. Vaughan's early work in biochemistry was done contemporaneously with that of Atwater at Wesleyan and Chittenden at Yale, and he was thus one of the first workers in this new field in this country. He was undoubtedly the first to hold a chair of physiological chemistry in a medical school in this country and to give chemical instruction from this more modern point of view.

Although the *Journal of Biological Chemistry* and the American Society of Biological Chemists were not founded until after Dr. Vaughan's interests had been turned quite largely toward bacteriology, still he was active in both of these undertakings. He was a collaborator of the *Journal of Biological Chemistry* from its founding in 1905 until 1920, and a charter member of the American Society of Biological Chemists in 1906 and one of its officers in 1910. The early volumes of the *Journal of Biological Chemistry* contain a number of important contributions by Dr. Vaughan's pupils, in particular upon the chemistry of bacteria and bacterial proteins.

In 1878 he published a textbook on "Chemical Physiology and Pathology" which went through three editions in as many years. Later he issued a quite comprehensive text on "Physiological Chemistry" in mimeographed form in order that he might have a book readily adaptable to the needs of his own students. He was early attracted to the field of nutrition and published "Balanced Diets" in 1887. Twenty-five years ago every student of bacteriology was familiar with Vaughan and Novy's "Cellular Toxins" which went through four editions. This book possessed a chemical background which could only have been given to it by men of thorough chemical training. In 1916, Dr. Vaughan was invited to give the Herter lectures at the University and Bellevue Medical College. These were subsequently published in book form under the title of "Poisonous Proteins." The writer well remembers the inspiration he received from these lectures, which beautifully summarize some of Dr. Vaughan's most important biochemical researches.

Despite his many administrative duties Dr. Vaughan not only found time to conduct research but by so doing furnished a very great stimulus to his students and colleagues. Of his numerous publications in scientific journals the larger number clearly show the influence of his chemical training. In connection with his work in bacteriology it is interesting to note that like Pasteur he was recruited from the ranks of the trained chemists. He apparently not only held the first chair of physiological chemistry in a medical school in this country, but organized the first bacteriological laboratory.

As one goes over some of his bacteriological publications in the early nineties, his chemical line of thought is evident. Such titles as the following may be mentioned: "Some new bacterial poisons," "The germicidal properties of nucleins," "The principles of immunity and cure in infectious diseases," "The nature of the germicidal constituent of blood serum." His work on tyrotoxicon, a poisonous substance which he found elaborated in cheese is well known, as is his work on ptomains, toxins and leucomains. Later the energies of Dr. Vaughan and his coworkers were devoted very largely to a study of the chemistry of the bacterial cell, and this work and related studies, as brought out in his Herter lectures on poisonous proteins, was probably his most important biochemical contribution. He considered the influence of these various factors in relation to fever, the phenomena of anaphylaxis, immunity and disease.

The inspiration which he received from his early chemical training followed him even after his retirement, as is evident from the titles of two lectures which he gave in 1927. These are: "The chemistry of living substance and its adaptability to its environment," the third Kober lecture given March 28, 1927, and "A chemical concept of the origin and development of life," an address at the seventy-third meeting of the American Chemical Society, April 13, 1927. One cannot read these papers without becoming deeply impressed by Dr. Vaughan's extraordinary, wide knowledge of the most recent developments in every branch of science.

—Victor C. Myers,
Cleveland.

VICTOR CLARENCE VAUGHAN AS A TOXICOLOGIST AND MEDICO-LEGAL EXPERT

WITH or without our consent the master whom we meet leaves a lasting impression upon our souls. And long is the list and sincere is the respect of those who must thus acknowledge their indebtedness to Dr. Vaughan. Born to the trials and tribulations of a warring, backwoods Missouri district, steeped in Latin and trained in chemistry, Dr. Vaughan emerged like a rising star out of a darkness and an obscurity from which only the hand of Providence (to quote his Huguenot ancestors) could have rescued him from eternal oblivion. And none knew this better than Dr. Vaughan himself who sagely remarks that by a slight turn in the circumstances of his early environment he might easily have become a western cowboy. Such is the stuff from which come those who erect the signboards of civilization.

With this magnificent background a B.S. degree from Mt. Pleasant College (Mo.), an M.S., a Ph.D., and an M.D. from the University of Michigan gave Dr. Vaughan a scientific training of the first rank. All of these degrees were granted to him between the years 1872 and 1878. But the real foundation of Dr. Vaughan's future greatness as an epidemiologist, a toxicologist and a medico-legal expert lay in his early and extensive experience as a teacher, first of Latin, then of chemistry (eight years), medical chemistry (one year), physiology (three years), physiological and pathological chemistry and materia medica (four years), and finally as director of the hygienic laboratory and professor of hygiene and physiological chemistry for twenty-two years. A vigorous and conscientious student, Dr. Vaughan developed rapidly and with great promise from the very start of his teaching career. Only those who in the classroom have faced large numbers of keen and alert medical students can fully appreciate the stimulus which this experience afforded Dr. Vaughan to work out and completely master every detail of the chemical, toxicological, physiologieal and pathological problems which he attempted to present to his classes. His knowledge of toxicology was enormously enhanced by great numbers of experiments which he performed, either for or with, his students each year. These experiments gave him a fund of first-hand experience which has probably never been surpassed by any individual worker. For his classes covered not only the chemical but the toxicological and pathological phases of the problems as well. Cautious and always extremely critical of his own work, widely conversant with the literature, and stimulated by his close association with many able colleagues and eager students, Dr. Vaughan used these experiences as the foundation upon which he rose to the highest pinnacle of eminence as a toxicologist and medico-legal expert.

While still a very young man his reputation as an expert along these lines began to reach out to more and more distant points, and the demand for his services became more and more insistent. The part played by bac-

teria in many epidemics, in food poisoning, and in the pathology of various obscure individual cases was not fully appreciated in the earlier years of Dr. Vaughan's work. This frequently led to confusion between cases of true chemical poisoning and those due to bacteria. In fact in the earlier years of Dr. Vaughan's scientific career the "germ theory" of disease was by no means universally accepted. And much of the work, and many of the original investigations, carried out in Dr. Vaughan's own laboratory, were devoted to clearing up the relations existing between true chemical poisoning and that due to living organisms, especially in epidemic form. Among Dr. Vaughan's earliest papers were articles dealing with the separation of arsenic and antimony. And much of his research dealt with other mineral, vegetable, bacterial and animal poisons. For the study of poisons, their chemistry, and their effects on living things, always held a peculiar fascination for him. And his work as a toxicologist and medico-legal expert nearly always dealt with this phase of the subject. A vigorous, scientific contest in one of these legal cases gave him a striking thrill and inspiration which he usually enjoyed immensely.

His long services as a member of the Michigan State Board of Health gave him many opportunities to benefit the public in the way of introducing, or of directing attention to, needed reforms in the preparation or preservation of food supplies, the purification of water supplies, or in the use and distribution of various poisons, such as the employment of sulphite in preserving meat, or of other chemicals for preserving milk.

Dr. Vaughan took part in a great number of medico-legal cases and among those which he himself considered most important may be mentioned the Hall case and the Millard case, both of these dealing with the postmortem imbibition of arsenic. Experiments performed by Dr. Vaughan in the latter case demonstrated conclusively (as had earlier been shown by Orfila and by Kidd) that arsenic will diffuse from a localized point throughout all the tissues of a dead and buried body. These cases had much to do with the enactment of laws prohibiting the use of arsenic in embalming fluids and on the exercise of greater care on the part of druggists in dispensing poisons. The Carveth case, the Hughes case, the Buchanan case, the Fleming case and the Waite case were others which stood out particularly in Dr. Vaughan's own memory. But it is probable that the coco-cola case, the benzoate of soda dispute, and the legal status of saccharine made the greatest impressions of all on the general public.

Dr. Vaughan learned much of the tricks, slips and dishonesty of the representatives, or misrepresentatives, of the law in these extensive experiences. And he not infrequently refused to serve in a case concerning the justice of which he was not certain, or in which his evidence might go against the deserving side. And on many occasions he took great pleasure in voluntarily giving the benefit of his experience and advice where these had not been sought in order that those who deserved help might receive it. Mentally he usually felt at his best on the witness stand, and among those who appeared, either with or against him, in numerous legal contests might be mentioned a long list of the most brilliant and renowned medico-legal experts of this coun-

try and some from Europe. Among these were Haines, Witthaus, Doremus, Hektoen, Prescott, Peterson, Le Count, Underhill, Benedict, Schultze, Valentine Mott, Jr., Wolff, Liebreich, Wiley, Langley, Kedzie, and many others. His long and varied experience as an expert witness led him to formulate certain rules for his own guidance in these matters. These were, first, never to accept service in a case unless he was convinced that there was scientific justification for the claims on his side, second, to avoid all sentiment in presenting his testimony, third, to be extremely modest in giving his qualifications as an expert, fourth, to maintain his good humor and not to assume a resentful or hostile attitude toward opposing counsel or on cross-examination, fifth, to insist on his right to qualify his answer if he preferred to make it more extensive than "yes" or "no," and sixth, to express no opinion as to the guilt or innocence of the person on trial.

Dr. Vaughan's work covered an enormous range and variety of subjects. In addition to more scientific definitions he used to tell his students that hygiene covered any subject about which he wished to talk. But throughout all of his investigations he never lost sight of the chemical and the toxicologic aspects of the problems involved.

While the list of his publications which dealt, either directly or indirectly, with toxicology and forensic medicine is very long, I need mention but a few here. Aside from his books on *Physiological Chemistry* (1878-80), *Cellular Toxins* (Vaughan and Novy, 1902), *Protein Split Products* (1913), *Epidemiology and Public Health* (1923), Dr. Vaughan contributed extensive special sections on the general field of toxicology to the *System of Legal Medicine* by Allan McLane Hamilton and Lawrence Goodwin (1894), to the *American Textbook of Pathology* (1902), to Forscheimer's *Therapeusis of Internal Diseases* (1915) and to the *Legal Medicine and Toxicology* (1923) by Peterson, Haines and Webster. As Dr. Hektoen has noted Dr. Vaughan served as a connecting link between the period of the sanitary chemist and that of the modern bacteriologist and he was familiar with the methods of both.

In the year 1885 Dr. Vaughan arrived at the conclusion that he had found in poisonous cheese a new chemical compound resultant on bacterial action to which he gave the name "tyrotoxicon." In carrying on these investigations Dr. Vaughan, in common with all other scientific workers of the time, was compelled to labor in much darkness with reference to the great diversity and toxicological possibilities of the bacterial inhabitants of the cheese, or other milk products, in which he concluded tyrotoxicon might exist. Strenuously and persistently and with the zeal of the true scientist he strove to isolate this poison in pure form. It is probable that no single ambition clung more tenaciously to his subconscious hopes than that of his desire finally to isolate and study this compound. For perhaps nearly twenty years his thoughts from time to time reverted to the isolation of tyrotoxicon. At one time he believed it was diazobenzene hydrate ($C_6H_5N.N.OH$), but later the evidence seemed to indicate it might be diazobenzene butyrate. With the passing of time and with the vast advance made in bacteriological knowledge it now seems probable that such a pure, simple compound as tyrotoxicon, as Dr. Vaughan conceived it, does not exist,

but that nearly, if not quite all, cases of cheese, milk or ice cream poisoning are due to bacteria. Largely by his own example, have the mists been cleared away, and a newer and more perfect conception of the etiology of these cases of poisoning has been substituted for his earlier vision of

TYROTOXICON

The chemistry of earth's compounds
With mysteries deep and dark abounds,
But rare indeed are those which hold
Or greater darkness can unfold,
Than that of tyrotoxicon
A myth-like drug phenomenon.

In tyrotoxicon we seem
To grasp a vision like a dream,
A useless thing when once it's found
It merely serves as higher ground
From which inquiring minds may rise
To nobler things and fairer skies.

The feeble beams of dawning light
Inspire our souls with growing might,
Divine's the spark that kindles thought
By which eternal gain is sought,
For thoughts like tyrotoxicon
Doth urge us on and on and on.

In tyrotoxicon we see
A beacon gleam for you and me,
A thing which like a moving light
Advancing onward out of sight,
Directs our hopes, our lives, our souls,
To greater things and higher goals.

The premises may not be right
The end-results may not be bright,
But he whose spirit passes on
Must be, like tyrotoxicon,
A stranger in a world unknown
To most of those he calls his own.

When at the rainbow's end we find
No gold, no cloud that's silver lined,
Some fleeting fancy, ere it's gone,
Some thought like tyrotoxicon,
May fire our souls and change our lives
And pave the way to paradise.

—D. E. Jackson,
Cincinnati.

VICTOR CLARENCE VAUGHAN AND HIS WORK AGAINST TUBERCULOSIS

IT IS commonly believed that the net effect of a person's accomplishments on human society can only be evaluated some considerable time after his personal influence has ceased to be felt. Lives recorded on this basis allow great economy in historical storage, since beyond a decade or two of a man's exitus what remains of his specific work rarely requires more than a statistical line. Such records have a paleontologic value but they contain no hint of the play of living forces that made them possible. What common people call the soul of man is equipped with hereditary attributes which determine his individual responses to environment. Among these intangible assets are potent, *aspiration, ambition, will, courage, tenacity, affection, character.* These, among others, are the forces that determine the human career, which make up the real man, which can instruct, guide and warn the student of biography. From this point of view the net accomplishments of a life are less important than a knowledge of how they were obtained.

The charming account of his own history[1] which Vaughan has left us has only implied the courage, tenacity and consistent purposiveness with which his designs were pursued. But its lack of egoism gives no direct hint of the aggressive power of the man, of his vision of the trend of events, of his keen judgment of men and his ability to secure their cooperation or override their opposition in the policies which his mature judgment dictated. Through devotion to science a great politician, perhaps a great statesman, was in him lost to the country.

The autobiography represents a youth between the ages of sixteen and twenty-three studying and teaching in a series of junior colleges in Missouri. Following on the heels of the Civil War, this seven years of education knew nothing of modern pedagogic facilities or technic. Few of the teachers themselves were expertly versed in their subjects, but the spirit was there, the lust for understanding in the pupil.

Probably every man who has emerged from the crowd has been able to point out in his long list of instructors one or a few to whom his intellectual and moral debt was exceptionally great. Such a teacher Vaughan encountered when, in his seventeenth year he came under the domination of the Rev. J. W. Terrill. Quoting Vaughan: "The college was a one-man institution and James W. Terrill was the greatest educator I have ever known; but like many others he was only great in the face of obstacles and became weak when these were removed. . . . The theory of President Terrill was that no one knows anything until he can clearly state it in writing. His criticisms of the

[1] "A Doctor's Memories," Bobbs Merrill, Indianapolis, 1926.

selection of words was scathing . . . . He was wont to question even the most direct and correct statements. In doing this he felt at liberty to resort to the worst kind of sophistry. Nothing delighted him more than to make a good student acknowledge his error when in fact he was right. Then with great glee he would point out the fallacy in his own argument and chide the student for being so easily browbeaten. He taught by disputation, a method of education beloved by the ancients but now fallen into desuetude. It has been of service to me, especially when on the witness stand. The only direct instruction I had from President Terrill was in Latin and what was then called 'mental and moral' philosophy. . . . There were ten in the class equally divided between the sexes. . . . Often the hour closed after the statement of eleven different religious creeds. The one good effect this course had on me is that I had never since combated anyone's religious belief. President Terrill made no pretension to a thorough knowledge of Latin and he plainly told me of his limitations the first day I met him. In fact his reading in this language had scarcely exceeded mine at the time. With this knowledge I accepted him as a teacher and I admit that for the first few months I received from him the most atrocious flagellations that were ever showered upon my shoulders by a teacher. Up to that time I had known only the so-called English, more correctly Scotch, pronunciation. At this he hurled all forms of ridicule. . . . At last after weeks of trial the devil was exorcised and I was congratulated on being fully prepared to converse with Cicero without giving him torture after old Charon had ferried me across the Styx."[1]

When he entered Mt. Pleasant College, Vaughan had but a vague idea of physics and chemistry, though at his home there were some old illustrated books on natural history which he had read with eager wonder.

One door in the college had always been locked until Vaughan obtained permission to investigate. Behind it he found a small room with shelves on which were numerous labeled bottles of pure chemicals. It was a miniature chemical laboratory of prewar days. "With Barker's *Chemistry* and its clear statement on nomenclature, it was easy to ascertain the composition of the contents of the bottles and to perform simple reactions, such as the precipitation of soluble salts of silver and lead with sodium chloride. The first time I made hydrogen sulphide the odor penetrated the whole building, and my embryonic chemical studies were threatened with complete annihilation. However, I learned discretion and finally I had permission to offer a course in elementary chemistry, at first limited to two or three students. During my last years at Mt. Pleasant I came into possession of a copy of Douglas and Prescott's *Qualitative Analysis* and this decided the question long debated in my mind as to whether I should choose classics or science for my life work, and where my education should be continued when I left Mount Pleasant. . . . . After my graduation (in 1872) I continued teaching Latin and Chemistry until February, 1874. Then came the inevitable break with President Terrill."

The foregoing outline includes the first stage of Vaughan's education. Its definite acquisitions consisted in a fair acquaintance with Latin and a limited knowledge of practical chemistry. The former must probably be

given credit for that forceful and graceful diction which later marked his spoken and written words; the latter was the solid corner stone of his future career.

But already were manifested the traits of the coming man. A personality aggressive and courageous to a degree; an alert intellectual curiosity; a keen responsiveness to the stimulus of difficulty and opposition; insistence on independence of judgment and individual mastery of understanding. But already, too, there was evidence of that yearning which seems to be exceptional among scientific men, especially those of laboratory training, namely, the humanistic impulse to know, to influence and to consort with his fellow men.

At the age of twenty-three, in the fall of 1874, Vaughan sought to pursue his education at the University of Michigan.

Like the rest of his countrymen with similar designs, he realized that the first great educational milestone to pass was an academic degree. He desired to concentrate on chemistry as a major, with geology and biology as minor subjects. Even in those days the irregularity of his preparation disqualified him for admission to the graduate school. But President Angell, with that vision for which he was famous, unhampered by convention, allowed the decision as to qualifications to be referred to a committee of three of the Faculty. The candidate, evidently sensing the proclivities of his examiners, realized that his ominous weakness lay in the field of crystallography, a specialty with one of them. His mode of reaction was characteristic. He obtained a half bushel of potatoes and with his knife reproduced from them all the crystal forms described in Dana's *Mineralogy*. The outcome was the acquisition of the degree, M.S. in 1875, and of Ph.D. in 1876, and his entrance as a student in the Medical School in the fall of the latter year.

All this time Vaughan was student and assistant in the chemical laboratory. Those who knew both men may suspect that the gentle, lovable and "square" chief of the department of chemistry, Professor Albert B. Prescott, must have exercised a very salutary influence over his younger colleague.

In the year preceding his matriculation as a medical student there was an upheaval in the chemical staff leading to dismissal of one of the principal teachers. Vaughan was appointed to fill the vacancy as Instructor in Physiological Chemistry. This office involved the soul-trying experience of lecturing to a horde of medical students who had their own views on the propriety of the new appointment; who were predisposed to turn "thumbs down" on the incumbent, in which case his future must have been passed in an advanced stage of purgatory. But through infinite tact and unsparing preparation Vaughan at once won popular indorsement from that critical and hard-fisted group of which he was soon to become a junior member. In 1878, he put in book form his lecture notes on physiological chemistry and of this there were published three editions in as many years.

During this time he must have been admitted as a junior member to the meetings of the medical faculty, the ruling forces of which were on the purely clinical side of medicine and represented in Practice by A. B. Palmer, Dean,

in Surgery by Donald Maclean and in Ophthalmology by G. E. Frothingham; an outstanding group of dominating personalities.

This was a period of fomenting unrest among the better minds of the medical profession over the inadequate standards of medical education. It was realized that a deficiency existed especially in the personnel and facilities necessary to the proper teaching of the Institutes of Medicine, whose foundation was recognized as of animal physiology. Henry Newell Martin, a product of the modern renaissance in English physiology, had been sent by Huxley and Foster to head the department of Biology in the newly founded Johns Hopkins University, in 1876. Martin soon established a laboratory course definitely designed as "preliminary to the study of medicine." This was nearly thirteen years before the opening of the Johns Hopkins Hospital and seventeen years before the beginning of its Medical School. The present writer had the good fortune to be Assistant in that laboratory.

Martin's extra-mural teaching was through example rather than precept and its influence upon the subsequent development of medical education in this country was beyond estimate.

Vaughan, though only of the rank of Assistant Professor, had acquired such respect in his Medical Faculty that he was given the initiative in plans to strengthen the "scientific" side of the medical curriculum. His first move was for the establishment of a special department of Physiology. In later years, Pathology, Anatomy, Pharmacology and Preventive Medicine were in turn impressed or created by his touch.

Principally through the efforts of V. C. Vaughan the present writer became the first incumbent of the chair of Physiology in the University of Michigan, in the Spring of 1881.

Tinctured with the same urge of scientific curiosity, Vaughan and I became intimately associated. We would drive out to some hillside and sit discussing the problems of research medicine in that pregnant era. One of these occasions remains vivid in memory. It was, I think, in June of 1881 or '82, when Vaughan started a dispute by stating, in effect, "I think they are making altogether too much of the part played by bacteria as a cause of disease!" The course of events ere long presented his seeking and plastic mind with new materials for thought; and with the solution of the first problem offered him his viewpoint changed and he entered upon the steady march of his final life work. A single dramatic event raised the curtain on the course of his scientific career. In 1883 and 1884 about 300 cases of cheese poisoning were reported to the health authorities of Michigan. To Vaughan was given the task of analyzing the cheese and demonstrating its relation to the casualties. He was able to extract from the incriminated substance an exceedingly minute fraction in crystalline form which proved to be intensely poisonous for animals, and gave confirmatory symptoms on himself. This product he described, and christened *Tyrotoxicon*, in 1885. Though his interest had begun to focus on preventive medicine as early as 1880, when he proved that the drinking water in a well could be contaminated by filtration of organic matter through a great stretch of soil, it was tyrotoxicon that

apparently first put him in touch with German literature and German men of science. The scientific Crusoe in the rural town of Ann Arbor reached out through the radio substitute of those days and came into communication, as later he did in personal contact, with the old-world champions of science.

Of great value in the development of his tastes and in the focalizing of his knowledge must have been the self-culture emanating from an elective course of lectures on Sanitary Science which was offered annually by Vaughan and to which all University students were eligible. These courses were initiated some time in the early '80's and became exceedingly popular. They played the part of scientific *conversaziones* in which Vaughan interpreted to laymen the fast-surging world thought of medical biology through the code of his own experience. He was an impressive and convincing speaker. Sitters in the back row missed nothing of his discourse. In his own words, "I counted a lecture hour wasted if I did not know more about the subject myself when I finished than when I began. As I proceeded in each lecture I saw my subject in a broader, or at least in a modified form; or there flashed upon me some better way of presenting the facts or making them more comprehensible to my students."[1] The important connotation is that for him scientific facts gained their interest from their bearing on human welfare. Hence his application of the tyrotoxicon discovery to general food poisonings and as a key to the summer diarrheas of children. It led him with his pupil, colleague and later successor, F. G. Novy, to put forward in 1888 a critical summary of existing knowledge on organic poisons, exogenous and endogenous (followed by two other expanding editions)[2]; and later, assisted by his elder sons, led him to produce one of the most original and clearest of all monographs devoted to the infant science of immunology.[3]

Vaughan's constant productive activity in the field of chemical bacteriology as applied to public health was one of the most important educating influences in the eighth decade of the last century. A critical scientific estimate of his work was signalized by his election to the Association of American Physicians in 1889, succeeded in 1915 by the extraordinary distinction of Honorary Membership.

Vaughan seems to have practiced medicine from the date of his graduation. In this responsive field he revelled in that "human touch" which vitalized his laboratory conceptions. Onlookers wondered at the energy that was distributed with adequate intensities between academic administration, teaching in the lecture room and laboratory, a large private and consulting practice, literary composition and, above all, original research. Yet he rarely seemed tired, and never in haste.

In that period, tuberculosis stood alone at the head of all mortality tables. In the Registration Area the death rate per 100,000 population was in 1900, 201.9; in 1920 it had dropped to 114.2.

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[2]Vaughan, V. C., and Novy, F. G.: Ptomaines, Leucomaines and Bacterial Proteids, ed., 2, 1897.

[3]Vaughan, V. C., V. C. Jr., J. W.: Protein Split Products, 1913.

Villemin, Pasteur, Koch had set up a shrine whose oracle spake words of hope and understanding that thrilled every scientific student of disease.

Vaughan but followed the natural law of his being when his interest and his energy became more and more definitely focused upon tuberculosis, especially in its pulmonary form, in both its social and its scientific aspects. He was like a radioactive element distributing the truth within him. His public addresses were powerful appeals for rational and practical tuberculosis control.[4] It was educative influences like his that led to the founding in 1904 of what is now the National Tuberculosis Association, in which he was a member of the first Board of Directors and President in 1919.

But with his ideals, tastes and training it would have been strange had Vaughan been content to regard tuberculosis as merely a forensic subject. Koch had disclosed the tubercle bacillus in 1882 and then, in 1890, announced its conqueror in tuberculin. This misconception of the remedy still awaits solution.

The world of scientific medicine was at a loss. The attacking agent in tuberculosis was known; but the conditions of *virulence* in this and other microorganisms, on the one hand, or of *resistance* in the invaded host on the other, had in no way been formulated. It is true that Salmon and Smith, in 1886, as a conclusion from their researches on hog cholera, had definitely stated that immunity may be produced by introducing into the animal body the chemical products of bacterial growth;[5] and in 1887 Sewall had demonstrated that pigeons, following serial sub-lethal inoculations with rattlesnake venom, could be protected against 7 times the fatal dose after a resting period of at least 5 months;[6] and that later, 1894, Calmette[7] and others, using cobra venom, prepared from the blood of inoculated animals a protective and curative anti-venom. But there was little known of the data of immunity and there was no general theory of the subject.

Nevertheless the ten years following 1890 may be called the Elizabethan period of bacteriology and immunology. As with miners in a gold rush, a "let's go" spirit enthused an unexampled swarm of finest intellects from well-nigh every land encircling the globe, all intent on finding the meaning of life from its lowest forms, in seeking to understand and control infectious disease. No proper estimate of those activities can be made by one unacquainted with the spirit of the times. Scientific ideals evoked an international enthusiasm comparable to the patriotism roused by sight of the national flag.

It was a period of intensive truth-seeking production in a virgin field. Remarkable, indeed, is the permanence and basic importance of the discoveries made in those days. The tremendous tome of Straus, after thirty-five[8] years, is delightful reading today and, for its period, as safe as now current literature.

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[4]Cf. The Problem of Tuberculosis, Wis. Med. Jour., July, 1905.

[5]A New Method of Producing Immunity from Contagious Disease, Proc. Biol. Soc., Wash., D. C., III, 1884, 6, p. 29, printed Feb. 22, 1886. (Ref. from Zinsser, in Infection and Resistance, p. 72.)

[6]The Preventive Inoculation of Rattlesnake Venom, Jour. of Physiology, 1887, viii, 203.

[7]Calmette, A.: Compt. rend. de la soc. de Biol., 1894.

[8]Straus, I.: La Tuberculose et son Bacille, 1895.

It was in this period that V. C. Vaughan, at early intellectual maturity, entered the arena against tuberculosis. Vaughan's studies had led him to vaguely anticipate the chemo-therapeutic idea, the effective agent of his conception finding its origin in the body of the host.

By an elaborate course of reasoning, checked by experimental data disclosed in current literature, Vaughan adopted certain tenets to guide his investigations; thus: 1, "Active immunity must be cellular in origin." 2, "Physiologically, nucleins may be said to form the chief chemical constituents of the living parts of cells. Speaking broadly, we may say that the nuclein is that constituent of the cell by virtue of which the histological unit grows, develops and reproduces itself. It is the function of the nuclein to utilize the pabulum within its reach. It must be evident that those tissues most abounding in cellular elements contain relatively the largest amount of nuclein. It must also be seen that it is by virtue of their nuclein that the cells of various organs and organisms possess and manifest their individual peculiarities." 3, "I am ready to believe that the immunizing substance (against bacterial disease) is a constituent of the bacterial cell itself: . . . . I believe it is the nuclein." 4, ... "the cause that brings into existence the condition of immunity is a bacterial proteid. Now, in order that this exciting cause may induce the condition of immunity, it must act upon something. . . . . Upon what organ of the body does it act?" "The cells upon whose altered activity immunity depends are probably those of the spleen, the bone marrow, the thyroid and thymus glands, and possibly other glandular organs. . . . . In what way are these organs concerned in the production of immunity? do they elaborate antitoxins, and if so, what can be said about the nature of these antitoxins? . . . . I have borne in mind the fact that these organs are the sources of the nucleated white blood corpuscles. Do these corpuscles contain germicidal or antitoxic substance; and if so what is its nature? . . . . The chief chemical constituent of nuclei is a substance called nuclein. . . . . Have the nucleins in general or as a class any germicidal action? As methods of isolating the nucleins are known this question can be answered by experimentation."[9]

Forty years of research have but confirmed the theoretical foundations of 1890: That the reactions of immunity are functions of the physics and chemistry of protein materials; that acquired immunity of a host to a pathogenic organism or toxic protein is in some way mediated through these same agents of offense. Vaughan's contribution to theory seems to have been a most rational and brilliant conception. It narrowed the field of research to a single group of chemical compounds, however multitudinous its varieties—those basically nuclein in composition. It was easy to believe that the class of chemical compounds specifically charged with vital reactions, without which there was no life, should furnish both the agents of attack and defense in infectious diseases.

It was toward the end of a year's intensive work upon the vital chemistry of the nucleins, with the indispensable and brilliant cooperation of Novy

[9]President's Address, The Principles of Immunity and Cure in Infectious Diseases. Medical Section First Pan-American Cong., 1893, I. 152. Reprinted in Med. News, 1893, lxiii, 393, 421.

and McClintock, that Vaughan, flushed with the marvellous promise of his results came in 1893 to deliver his presidential address before the section on Medicine of the Pan-American Medical Congress on "The Principles of Immunity and Cure in Infectious Diseases." Even so, his scientific inhibitions were notable in his preliminary reservation: "The value of a theory does not wholly depend upon its truth, but is rather measured by the fruitfulness of the lines of investigation that it opens. Indeed, a theory may be wholly erroneous and yet it may lead to important discoveries."*

Due credit was given for the origin of the nuclein conception to that great trio of investigators, Brieger, Kitasato and Wassermann. These workers, however, had found no evidence of germicidal or immunologic properties in nuclein preparations from pus. Vaughan attributed their failure to the unfortunate selection of pus as a source of nuclein and also to the drastic chemical methods for its isolation.

The researches of Vaughan and his colleagues followed a logical order. They studied through plate cultures the germicidal properties of nucleins isolated by them from various sources, as the testes, the thyroid gland and yeast cells.[10]

Vaughan's optimistic estimate of their results was, "Now that we have learned that the animal body itself generates a germicide more powerful in its action than corrosive sublimate, and since we know how to increase the amount of this substance in the blood, and can isolate it, and inject it into other animals, renewed hope comes to us."[9]

It will be remembered that at about this time immunologists were divided into two camps according to their views of the anatomic seat of immunity. According to one group it was an exclusive property of cells, fixed or at large; the other group claimed that immunity was essentially humoral, a property of the blood and lymph.

It had already been discovered that the blood itself possessed definite germicidal powers. A review of the literature made it obvious that this property pertained to some proteid constituent.

Vaughan and McClintock sought to identify this proteid and formulated two questions: "Is there a nuclein in the blood serum? Has this nuclein, if there be one, germicidal properties?" Suffice it to say, they extracted from the living blood a substance which possessed the characters of nuclein and solutions of this substance proved to have distinct antiseptic if not germicidal powers. They concluded that normal blood owes its germicidal powers to nuclein.[11] This work was confirmed in a paper published by Kossel in February, 1894.

[10]Vaughan, V. C., Novy, F. G., McClintock, C. T.: The Germicidal Properties of Nucleins. Med. News, 1893, lxii, 536.

[11]Vaughan, V. C., McClintock, C. T.: The Nature of the Germicidal Constituent of the Blood, Med. News, 1893, lxiii, 701.

*The same thought is attributed to John Wilkins, a leading member of that coterie, in 1648, which later formed the nucleus of the Royal Society. After a futile effort to develop a method of perpetual motion, he reflects, "though we doe not attaine to the effecting of this particular, yet our searching after it may discover so many other excellent subtilties, as shall abundantly recompense the labour of our enquiry." Science News Letter, 1930, p. 252.

Closely following or attending these researches in vitro, many coordinate experiments were made in vivo.

In his paper on *The Treatment of Tuberculosis with Yeast-Nuclein,* Vaughan summarized the conclusions already noted here as well as some from experiments on animals, as follows: "3, Rabbits and guinea pigs may be protected against virulent cultures of the diplococcus of pneumonia by previous treatment with hypodermic injections of a solution of yeast-nuclein. 4, The immunity thus secured is not due to the action of the nuclein as a germicide directly. 5, The process of securing this immunity is an educational one, and most probably depends upon the stimulating effect of the nuclein upon some organ whose function it is to protect the body against bacterial invasion. . . . . 8, Attempts to render guinea pigs immune to tuberculosis by methods so far employed show that previous treatments with nuclein retard, but in the majority of cases do not prevent, the development of tuberculosis from subsequent inoculations. 9, Attempts to arrest tuberculosis already developed in guinea pigs, by treatment with solutions of yeast-nuclein, have been followed with varying results, depending upon the virulence of the germs used in inducing the disease, the stage of the disease, when the treatment is begun, and the susceptibility of the animal, especially as influenced by age. Upon this point we have bestowed much time and labor but the results have been so conflicting that I am not yet prepared to formulate any positive conclusions. . . . . 10, I have used nuclein with benefit in the treatment of indolent ulcer, tonsillitis and streptococcus diphtheria."[12]

Two series of experiments were performed upon rabbits from which it was concluded, (1) "that rabbits may be rendered immune to tuberculosis by previous treatments with yeast nucleinic acid"; further, (2) "that when treatment is begun within three or four days after the inoculation, the development of tuberculosis in rabbits may be prevented by yeast-nucleinic acid."

His animal experiments led Vaughan to realize the importance of more completely standardizing his nuclein solutions. In the early work the percentage of nuclein in the vehicle was unknown and this was contaminated by other proteid material. He found it a mistake to administer the nuclein in strongly alkaline solution.

McClintock proved that guinea pigs inoculated with tuberculosis sputum died earlier and with more extensive disease when treated by hypodermic injections of sodium carbonate than the untreated controls.

After more satisfactory purification of the nuclein solution and with a standardized strength of one per cent of nucleinic acid, treatment was ventured upon human patients with tuberculosis.

The diagnostic criterion for tuberculosis was the presence of tubercle bacilli in the sputum or urine, respectively. The treatment of the pulmonary disease was by intramuscular or hypodermic injection of the nuclein solution, beginning with a small dose of 3 to 10 minims, gradually increased to 80 minims, the injections being repeated at intervals of one to several days.

[12]Vaughan, V. C.: Med. News, 1894, lxv, 657, 675.

In genitourinary cases the medium was injected directly into the bladder, and under certain conditions was given by the mouth.

Vaughan gives a judicial estimate of his remedy. He writes: "I am convinced, especially from my experiments on animals, that nucleinic acid, improperly used, may do harm. It acts, as I have elsewhere shown, by stimulating the organs that elaborate the polynuclear corpuscles, and these may be overstimulated. Nucleinic acid fails to be of service unless these cell-forming organs respond. They may fail to respond on account of lowered vitality, or they may be paralyzed, as it were, by an excessive dose of stimulant."[13]

Sufficient evidence is not at hand to properly evaluate this remedy. The ever-growing scrap heap of artificial laboratory synthetics makes one wonder if it were not wiser that we try out more completely *this* synthetic discovered, manufactured and found indispensable by Nature herself.

In the middle of the '90's Vaughan had referred to me patients for treatment while they were receiving the climatic benefit of sojourn in Colorado. No adverse criticism of the remedy per se could be made, except that on one occasion I gained my first experience with anaphylaxis. A female patient had received, subcutaneously, a series of injections with apparently good effect when, one day within a minute or so of the treatment, she began to suffer urgent air hunger which kept her, and myself, in great distress for perhaps an hour. Nevertheless, the experience was not without educative value; it had been habitual for me to observe the bulla on the skin caused by the subcutaneous retention of the 2 or 3 c.c. of solution injected. On the occasion described *no* bulla was formed, which probably meant that the fluid had directly entered the blood stream through a vein—the ideal condition for anaphylactic shock.

After two and a half years, ending December, 1895, in the treatment of tuberculosis with yeast-nuclein, Vaughan summarized his experience as follows:[14] "The cases include all in which tubercle bacilli were found. There was no selection of cases and no exclusion. Many were in the last stages of disease when treatment was begun. I tried to carry on the treatment as if in a laboratory experiment, not to deceive myself. Of the 76 cases reported, 70 were of Pulmonary Tuberculosis. Of these 30 (42⅞ per cent) have died; of these at least 9 were temporarily benefited. Of the 70 cases, 17 (24⅔ per cent) have been continuously free from the bacillus for from one month to 2½ years so far as sputum, when present, shows. Twenty cases (28⅔ per cent) were still infected at the last examination, but apparently 16 of these have been improved by the treatment. Of the 5 cases of urinary tuberculosis 4 have apparently been cured, one, benefited temporarily, died of miliary tuberculosis. The one case of joint tuberculosis has been benefited."

The fertile mind of Vaughan produced unceasingly. From 1875 to 1914, inclusive, 198 titles appeared under his name, several of considerable volume.

[13] Ibid., p. 681.

[14] The Physiological Action and Therepeutic Uses of Yeast-Nucleinic Acid, with Special Reference to its Employment in Tuberculosis, Med. News, N. Y., 1897, lxx, pp. 257, 296, 328, 362, 387.

Equipped with intellectual and virile power as he was, the affections of the heart ruled his life through that Companion "whose unfailing love," he says, near the end, "has cheered me in both fair and foul weather and whose wise counsel has been my staff and support along the way."

When faltering under the final cruel blow to his health, he attended the meeting of a beloved Scientific Society in Washington to receive its gold medal of appreciation; to encouraging words of a friend meant to cheer him, the response was a wistful look and, "It is a beautiful world."

—*Henry Sewall,*
Denver.

VICTOR C. VAUGHAN, M.D., PH.D., SC.D., LL.D., AT PEKING, CHINA, 1927

VICTOR VAUGHAN'S WORK IN IMMUNOLOGY

IN GOING over the scientific papers of Victor Vaughan in chronological order, it is interesting to find that his life covered almost the entire period of the development of immunology. The book which he wrote with Novy on *Cellular Toxins* was first published in 1888. It was only ten years before this that Pasteur and Koch were carrying out their investigations on wound infections. Metchnikoff's studies on phagocytosis were not seriously begun until 1880. Pasteur's method of immunization against rabies was not published until 1885. Behring's fundamental antitoxin investigations were not to appear until 1890, and Pfeiffer's discovery of bacteriolytic and bactericidal effects were still six years in the future. Vaughan was working at a time when the conceptions of bacterial toxemia were dominated by the belief that the poisons involved in infectious disease were produced by the putrefactive and fermentative actions of the bacteria upon the proteins of the host. Brieger had published his study of the ptomaines in 1885 and Gautier, Griffiths and others were investigating the physiologic action of toxic protein derivatives in animals. Selmi in 1885 had described poisonous bases obtained from human cadavers. The work of Vaughan and Novy takes a worthy place next to these important biochemical investigations. They studied not only the ptomaines themselves but sought for similar substances in cultures of pathogenic microorganisms. Among these were the poisonous substances developed in cultures of the intestinal bacteria from summer diarrheas in infants, a subject in which, perhaps, such products of bacterial cleavage may still play an important rôle. They isolated from mixed cultures of typhoid stools a poisonous base which was obtained as a crystalline salt and which produced purging and temperature elevations in cats and dogs. Similar substances were obtained from hog cholera cultures and from a number of other bacteria. This work logically led to biochemical investigations of food poisons, studies which contributed not only to a better understanding of the toxic protein derivatives themselves but had an important and beneficial effect upon the development of methods of food preservation.

Though the fundamental observations of these early studies were almost entirely biochemical in nature, their bearing upon infectious disease was considerable. Although their importance in connection with the pathogenicity of infectious microorganisms was diminished by the discovery of the bacterial exotoxins, yet much accurate information was added to a field of protein chemistry which has become of great significance in other directions. Vaughan was quick to recognize the value of the discoveries of other men and their modifying influence upon older conceptions, and in the 1902 edition of *Cellular Toxins* he incorporated a treatise on antibodies and immunity in which he demonstrated his capacity for clear reasoning—equalled, it seems to us, at that time only by Behring himself—in recognizing the necessity for

the correlation of the humoral and cellular schools of immunity. His critical comments in the summarizing chapter of this edition, dealing with this and other problems of equal importance, were entirely free from the tendency of partisanship which dominated much of the controversial literature of that period. Many of the statements and comments which he makes in this chapter, as pure deduction, especially in regard to the relations of the cellular and humoral mechanisms, have been justified by later experimental developments.

Among other things, Vaughan occupied himself at this time with a discussion of the origin of antibodies from the antigen, the Buchner retention idea which is again becoming prominent after many years during which it has been completely disregarded. That Vaughan was not easily carried away by attractive results published upon insufficient experimental evidence is apparent in his brutally frank criticisms of the results of Smirnow, who claimed at this time that he had converted toxin into antitoxin by the long-continued action of electric currents—results which had been confirmed by Bolton and Pease and others.

Vaughan's advantage over most workers in the biologic field for that day—and, for that matter, over many workers of our own time—was the broad scope of his knowledge, which covered the methods of organic and biochemistry as well as those of physiology.

His subsequent interest in the toxic split products of bacteria was a natural consequence of his earlier work. Those who professionally followed the interesting period in immunology during which anaphylactic phenomena brought a new and deeper understanding of the physiology of reactions to foreign proteins will recall the important effect of the publications of Vaughan and his collaborators on this subject. Wolf-Eisner, Friedberger and others had, at this time, brought forward the idea that many of the phenomena of bacterial injury and possibly those of anaphylaxis were due to cleavage exerted by specific antibodies upon the bacterial protein. This conception was attractive because of its simplicity and was supported by a considerable volume of suggestive experimentation. Subsequent demonstration that there was no protein cleavage involved in antibody reactions, that symptoms similar to those supposed to be due to bacterial cleavage could be produced in guinea pigs with indifferent materials, and that the anaphylactic reaction was a cellular rather than a humoral process, rendered these simple explanations of anaphylactic phenomena untenable. Vaughan's work, however, in its demonstration of a toxic constituent, chemically separable from the bacterial body, with which acute death could be produced in guinea pigs similar symptomatically and physiologically to anaphylactic death, had an important influence upon the development of what is now known as the "anaphylatoxin" reaction. This phenomenon was subsequently studied in great detail by his pupils Novy and de Kruif, and though it has shed relatively little light upon anaphylaxis, it has had great influence in elucidating a group of occurrences which one cannot help but believe possess an importance not yet fully appreciated in the pathology of the infectious diseases.

The formidable collection of papers on split products of bacterial protein were summarized in the book Vaughan published with his sons in 1913. This

volume in addition to the report of the investigations mentioned includes his experiments and ideas upon protein fever—in connection with which, incidentally, he asserted the frequent unchanged absorption of foreign proteins through the intestinal mucosa, a fact which has now become an important premise in our knowledge of the development of idiosynerasies. This book includes, as well, a thoughtful treatise on immunologic theory in which he again applied his well-balanced judgment to controversial points, recognizing the theories of Ehrlich as important scaffoldings for experiment but not allowing them to dominate his conceptions of immunity to the extent to which they had done this in the minds of many other leaders in this subject.

While, thus, Victor Vaughan's contributions to immunology were fundamental and made him throughout his life one of the most distinguished workers in this science in America, he at the same time kept in touch with all important phases of medical development. In each of the many marginal activities which in the case of other men might have become dilettantisms or hobbies he attained eminence and made useful contributions. His extraordinary versatility can be appreciated only by an examination from year to year of his publications. During the time that he was doing the work discussed in the preceding paragraphs, largely a result of his predominant interest in chemistry, he turned his attention to problems of nutrition and the values of foods. At the same time he made excursions into the fields of pharmacology and physiology, studying the physiologic action of drugs and problems of gastric secretion. And his studies on the distribution of metallic poisons in the body led him into medico-legal work in which he was a pioneer in this country.

One has the impression, in reviewing his various activities, that all of them sprang logically one from another out of a superabundance of intellectual vitality and natural interest. His research appeared to satisfy only a part of his desire for action. His interest in men and affairs was expressed in the administrative activities by which he founded and guided one of the most important medical schools in America and gathered about him a faculty of distinguished scholars. And from the same interest in men generally arose his enthusiasm for public health. In this field again, both as a military surgeon in the Spanish and the World Wars, as editor of a public health journal and author of a standard work on epidemiology, he transformed what might have been a purely secondary interest into a career which might have been a sufficient life work for many men. Among his purely incidental contributions in this field was the discovery of the indirect transmission of typhoid fever by flies, so important in rural and military sanitation.

It is difficult to appraise whether Victor Vaughan was more important to medicine as an administrator, a toxicologist, a medico-legal expert, a biochemist, a sanitarian or an immunologist. It is useless to endeavor to do so. He made the type of contribution to immunology which kept it rigidly in the field of controlled experiment, permitting himself speculation only on the basis of thorough correlation of the various fields of biologic research of which he was a master, and he influenced immunology in the United States

and in other countries by important contributions both of observation and of reasoning. And this he accomplished without in any way limiting his field and, at the same time, impressing his personality on other branches of medicine in a manner that made him a unique figure in American science. It is questionable whether, in the growing intricacy of medical investigation, activities so diversified can again be successfully combined in the lives of other individuals. In the period during which Vaughan lived, when American medicine went through its most vigorous years of growth, there was probably no other figure in the United States, with the exception of Welch of Baltimore, who had as much influence upon sound development, upon accuracy of method and upon enthusiasm for the revelation of truth as Victor Vaughan.

Of the influence of his personality on younger men both in scientific matters and in human intercourse, it is quite impossible to speak in an article as brief as this.

—Hans Zinsser.
Boston.

Editor's Note: Dr. Vaughan served until his death on the advisory editorial board of the *Journal of Immunology* and of the *Zeitschrift für Immunitätsforschung und Experimentelle Therapie.*

CONTRIBUTIONS TO EPIDEMIOLOGY AND PUBLIC HEALTH

VICTOR C. VAUGHAN, like so many other scientists who pioneered in public health and epidemiology, was attracted into these new fields of medicine through his love of chemistry.

Following his introduction to chemistry in Missouri, it was natural that the student should crave an appointment to the laboratory of one well versed in chemical science and so, enticed by the first edition if Douglas and Prescott's *Qualitative Analysis*, the young teacher chose the University of Michigan as a place for further education since here, at least, science found equal favor with the classics.

Doctor Vaughan was a pioneer in public health in Michigan. Preparation not only in the laboratories at Ann Arbor but fortification with studies abroad soon brought him abreast with the newest thought and discoveries in physiologic chemistry and bacteriology. In 1888 he studied in Koch's laboratory and received instruction under the trained guidance of Carl Frankel. In that same year he visited with Pasteur and Roux; spent some days with Pettenkoffer, the brilliant young epidemiologist of Munich, who had driven typhoid fever from that city; visited and studied the work of other European scholars, who, at that time, were creating the new science of bacteriology. In the early nineties he attended the International Congress on Hygiene at Budapest and heard von Behring read his paper on diphtheria antitoxin. He brought some of this marvelous curative agent home with him, some of the first in America, the very first available in Michigan.

Doctor Vaughan was a practitioner of medicine for over twenty years. During this time he not only served as the family counsellor for his many friends on the faculty at Ann Arbor and for the students enrolled at the University but he likewise had a large consultation practice throughout Michigan and the neighboring states. Thus he built up as a background for his epidemiologic studies an intimate and fundamental foundatiin of clinical medicine. Through his work as director of the hygienic laboratory and as a member of the State Board of Health he possessed an ideal opportunity to bring together the viewpoints of the health officer, the vital statistician, the chemist, the bacteriologist and the clinician. Doctor Vaughan described an epidemiologist as a student of etiology, symptomology and pathology. No definition could better apply to his own training. He believed that every case of infectious disease constituted potentially the seed from which many cases might develop. He not only looked upon each patient as a sick individual requiring the best of medical care but he also pictured the patient as a possible source of danger to other members of the household and the community at large. The public health aspect of the case so essential to the suppression of contagion was not wanting.

Soon after his arrival in Michigan he became interested in popular health instruction. The dissemination of scientific knowledge in terms which the

layman might readily comprehend was ever foremost in his mind as evidenced by the fact that after leaving the University in 1921 he went to Chicago for a year and under the auspices of the American Medical Association started the publication of *Hygeia*, a popular health mazazine.

In the early eighties it was customary to hold sanitary conventions in different towns throughout the State of Michigan. In 1882 we find one at Ann Arbor of which Doctor Vaughan served as Secretary. The announcement, a copy of which we have at hand, begins with an enumeration of sanitary apparatus placed on exhibit. The program in which the layman as well as the sanitarian participated was devoted to such public health problems as ventilation, water supply, school hygiene, control of smallpox, public health law, milk, etc. These conventions which were held several times each year in different towns usually took place at the courthouse or in some other public building to which the entire community was invited. Not infrequently were the regular meetings of the State Board of Health held at the same time and place.

Doctor Vaughan was appointed a member of the State Board of Health in 1883 and served continuously until the Board was abolished in 1919. During much of this time he was its President. His early interest in food and water is evidenced by the fact that when first appointed a member of the State Board of Health he served as Chairman of two important committees, one, that on Food, Drink and Water Supply, the other on Poisons, Explosives, Chemicals, Accidents, and Special Sources of Danger to Life and Health.

During the early years of his service as a member of the State Board of Health, he was frequently called upon to investigate reports of food poisoning and to determine the cause of epidemics of typhoid fever. In those days the Board members did not serve exclusively in an advisory capacity but assisted the able Secretary, Dr. Henry B. Baker, in surveying conditions throughout the State which might be inimical to health. In this way investigations were made of the sanitary condition of jails and public institutions where special attention was directed to an examination of the water and air supply and the means of disposing of sewage.

The State Board of Health was especially interested in stimulating research in sanitary science. At a meeting held in December, 1883, a resolution was passed that a sum not exceeding $300 be appropriated to pay for results of original investigation in sanitary subjects and further that the Board desired to encourage special investigations into sanitary conditions at localities, with special reference to water supply, ventilation of public buildings, and the origin of epidemics of diphtheria and other contagious diseases. At this same meeting Doctor Vaughan spoke of the need of a fully equipped hygienic laboratory at the University of Michigan.

Appreciating the value of directing health education through the public schools, the Michigan State Board of Health at an early date created a Committee on Textbooks which prepared a primer on hygiene and physiology which was used very extensively. Doctor Vaughan became a member of this committee in 1883 and thus played an intimate part in popular health instruction in Michigan. Through such textbooks which were used extensively throughout the school system, the average Michigander soon became ac-

quainted with the fundamental facts concerning hygiene and disease prevention. This was to prove of inestimable value in the campaign against ignorance and superstition which contributed so greatly to the reduction of the mortality from tuberculosis and other communicable diseases.

In 1883, Doctor Vaughan became a member of the American Public Health Association which organization, although but ten years old at that time, has become a leader in the promotion of public health administration throughout the North American Continent, and encouraged and fostered administrative research and studies in epidemiology and the evaluation of public health procedure. The laboratory method of thoughtful and painstaking inquiry manifested itself at an early stage in the development of the Association.

Stimulated by "the probable visitation of cholera in the near future," the Association at its annual meeting in St. Louis in 1884 created a committee "to examine the subject of disinfectants, antiseptics, and germicides in their relation to preventive medicine and sanitation" and "to formulate a table of these agents for the information of those interested, the agents to be classified, so far as may be deemed advisable, according to their specific virtues, facilities of application, and economy of use."

Doctor Vaughan, then a member of the Michigan State Board of Health, served as a member of this committee of which Major George M. Sternberg, later Surgeon-General of the Army, was Chairman. The committee consisting of seven members was immediately subdivided into two groups, the first to examine the literature of disinfectants, and abstract and tabulate the results, and to investigate in an exact manner in the laboratory the relative germicidal value of the various substances used as disinfectants. The second group, to which Doctor Vaughan belonged, was appointed especially to investigate the practical application of such disinfectants as are found efficient, upon a large scale, their cost, methods of use, chemical relations, effects upon furniture or fabrics, or their possible poisonous effects upon human beings or animals. Vaughan made a special study of the possible use of mineral acids including hydrochloric, sulphuric, nitrous, nitric, chromic and osmic acids. He also studied experimentally the possibility of employing mercuric chloride as a disinfectant for cesspools and privy vaults and the passage of this highly poisonous salt through the soil into wells. The study included the action of mercuric chloride on lead pipes. This committee not only reported in detail upon the numerous experiments which were conducted to determine the relative value of the known germicides, but it prepared a statement of the object of disinfection and its application to sewage, excreta, clothing and general treatment of the sickroom.

Mr. Henry Lomb, of Rochester, N. Y., through the American Public Health Association, offered four prizes for essays on health subjects. Dr. Vaughan's contribution, "Healthy Homes and Foods for the Working Classes," was one of the prize winners. Published in 1886, the pamphlet of 62 pages was distributed generously throughout the country.

In October, 1886, at the suggestion of the Michigan State Board of Health of which Doctor Vaughan was a member, the Regents of the University of Michigan asked the legislature for an appropriation to build and equip a

laboratory of practical hygiene in which original investigations as to the causation and nature of disease might be made. In June, 1887, the Regents established a Department of Hygiene and appointed Doctor Vaughan director of the laboratory and professor of hygiene, and Frederick G. Novy instructor in hygiene. Although the new laboratory building was not ready for occupancy until the fall of 1888, a year earlier Vaughan and Novy began their work, using rooms and apparatus belonging to the Chemical Laboratory. The first few weeks were spent in investigating fatal cases of milk poisoning. In 1885, Vaughan had succeeded in isolating the active agent of poisonous cheese, to which he gave the name tyrotoxicon.

The greater part of the first three months was devoted to an investigation of an epidemic of typhoid fever at Iron Mountain. At that time there were on an average about 1,000 deaths and 10,000 cases of sickness from this disease annually in Michigan. Epidemiologic studies carried on by the new Department of Hygiene not only in the laboratory but in the field and at the bedside, called attention to the need of improving public water supplies. The dangers from polluted food supplies and the necessity of disinfecting all discharges from the patient were likewise emphasized. The nature of the poison in ice cream, cheese and other food products which produced outbreaks of food poisoning was given much attention. That the desirable diet for healthy individuals was not overlooked is indicated by the publication by Doctor Vaughan of model diet tables which appeared in the annual report of the Michigan State Board of Health for the year 1889.

The objects of the new Hygienic Laboratory at Ann Arbor were threefold; first, original investigation into the causation of disease, second, the examination of samples of food and drink, at a nominal cost, on the request of local health officers and, third, the instruction of students in hygienic investigations. Therefore health officers frequently called upon the director of the laboratory to decide as to the potability of samples of drinking water. Some analyses were made for those residing in other states. Vaughan felt that to be of service in preventing the further spread of typhoid fever, the report must be returned to the health officer within a week, at most, after the water had been received. The laboratory in its early days worked out a plan of procedure which became known as the Michigan method.

> "As soon as the water is received, plate cultures are made and a test tube of beef tea is inoculated with one drop of the water. This tube is placed in an incubator and kept at 37° C. for twenty-four hours. Then twenty drops of the beef-tea culture are injected with a sterilized syringe into the abdominal cavity of a white rat or guinea pig. In some instances rabbits have been used, and with these the amount injected has varied from twenty to sixty drops, according to the size of the animal. If the water contains a pathogenic germ the animal dies, usually within twelve hours. A postmortem is made, the gross appearance noted and plates are prepared from the spleen, liver, kidney, and sometimes from the blood. After twenty-four hours longer these plates have generally developed (in some instances a longer time is required), and they are compared

with the plates made directly from the water. On the plates made directly from the water the germs are counted and their general appearance noted after twenty-four, forty-eight, and seventy-two hours. In the meantime the chemical analysis is completed, and under favorable circumstances the report can be made three days after the water has been received. A week furnishes all the time required in any case. The germs taken from the plates can then be studied at leisure."

Doctor Vaughan specified as a second condition of a good report, especially when the water is condemned, a statement of such a nature that it would convince the average mind. He believed that chemical and bacteriologic methods then employed would not suffice and although it is true that the fact that a germ kills a rat does not furnish positive proof that it will cause disease in man, it was the most convincing proof that the water was not safe to drink.

The epidemiologist and health officer of 1888 had much difficulty in convincing the layman that the polluted water which he and his grandparents had drunk for years, was the cause of typhoid fever in his home. Doctor Vaughan frequently told the story of the well used by his neighbors, the water from which he declared unsafe after several cases of typhoid had developed in the household, and how he had boarded and nailed up the opening and removed the pump handle, only to find afterward that another opening had been cut in the boards and a new pump provided with the inevitable result that there was more typhoid. Indeed, he stated that this persistent obstinacy and foolhardiness of the townspeople enabled Doctor Vaughan to provide for his growing family since he cared for the sick as family physician in addition to giving advice to the healthy with respect to disease prevention.

Following his service as Division Surgeon in Cuba during the Spanish-American War, Doctor Vaughan, together with Major Walter Reed and Major E. O. Shakespeare, was appointed on a board to study the causes and spread of typhoid fever among the troops in the various camps within the United States. Typhoid fever appeared in every regiment in the United States service in 1898, more than 90 per cent of the volunteer regiments being invaded by this disease within eight weeks after assembly in camp. Not only did typhoid fever appear in every regiment but became epidemic in both small and large encampments irrespective of whether the camps were located in northern or southern states. The investigations of the typhoid fever commission brought to light many facts with respect to the epidemiology of this disease which were destined to affect favorably the health of troops in future wars and materially assist in the gradual elimination of this disease from civil populations. The miasmatic theory of the origin of typhoid fever was not supported by the investigations. Murchison's pythogenic theory that typhoid fever might be generated independently of a previous case by fermentation of fecal, and perhaps other forms of organic matter was found to be erroneous. The investigations of the commission did confirm the doctrine of the specific origin of typhoid fever.

Among the conclusions drawn from this study which is probably the most

complete epidemiologic study ever made of typhoid fever, the following are worthy of particular emphasis: (1) typhoid fever is disseminated by the transference of the excretions of an infected individual to the alimentary canal of others; (2) this disease is more likely to become epidemic in camps than in civil life because of the greater difficulty of disposing of the excretions from the human body; (3) a man infected with typhoid fever may scatter the infection in every latrine of a regiment before the disease is recognized in himself; (4) camp pollution was the greatest sanitary sin committed by the troops in 1898; (5) some camps were unwisely located; (6) in some instances the space allotted the regiments was inadequate; (7) many commands were allowed to remain on one site too long; (8) requests for change in location made by medical officers were not always granted; (9) superior line officers cannot be held altogether blameless for the insanitary condition of the camps; (10) greater authority should be given medical officers in matters relating to the hygiene of camps; (11) in a general way the number of cases of typhoid fever in the different camps varied with the method of disposing of excretions; (12) the tub system of disposal was condemned; (13) the pit system was unsatisfactory in permanent camps; (14) the water-carriage system was recommended for permanent camps and where impractical all fecal matter should be disinfected and then carted away from camp; (15) infected water was not an important factor in the spread of typhoid fever; (16) flies undoubtedly served as carriers of infection; (17) men transported infected material on their persons or in their clothing, and thus disseminated the disease; (18) personal contact was undoubtedly one of the means by which the infection was spread; (19) it is probable that the infection was disseminated to some extent through the air in the form of dust; (20) a command badly infected with typhoid fever does not lose the infection by simply changing location; (21) when a command badly infected with typhoid fever changes its location, it carries the specific agents of the disease in the bodies of the men, in their clothing, bedding and tentage; (22) after a command becomes badly infected with typhoid, change of location, together with thorough disinfection of all clothing, bedding and tentage, is necessary; (23) even an ocean voyage does not relieve an infected command of disease infection; (24) except in cases of most urgent military necessity one command should not be located upon a site recently vacated by another; (25) the fact that a command expects to change its location does not justify neglect of proper policing of the ground occupied; (26) it is desirable that the soldiers' beds should be raised from the ground; (27) in some of the encampments the tents were too much crowded; (28) medical officers should insist that soldiers remove their outer clothing at night when the exigencies of the situation permit; (29) malaria was not a prevalent disease among the troops that remained in the United States; (30) the percentage of deaths among cases of typhoid fever was about 7.5; (31) the shortest period of incubation in typhoid fever is probably something under eight days.

While other general conclusions were made by the typhoid fever commission, those above mentioned will indicate the nature of the report, the completeness of its character and its inevitable influence upon future concentra-

tion of man power for military purposes. Particular attention was focused upon the fact that typhoid epidemics are not always due to water-borne infection or to contaminated food supplies but that contact both direct and indirect may have a predominating influence in the spread of infection. That flies may serve as a vector in the spread of disease was proved beyond a doubt. The need of giving higher authority to medical officers was forcibly emphasized with the result that during the World War the medical officer was given a sufficient increase in rank so that the line officers were compelled to pay some attention to his suggestions. The epidemiologic report prepared by Vaughan as sole survivor of the typhoid commission, paved the way for improvements in sanitation which have virtually eliminated typhoid fever as a serious disease in military life. The Japanese adopted the recommendations of the commission, in toto, during the Russo-Japanese War, demonstrating conclusively their validity.

During the World War, Colonel Vaughan joined his colleagues in the Army where he served as one of the medical advisors to the Council of National Defense and as friend and counsellor to General Gorgas. His official assignment was to direct the Communicable Disease Division of the Surgeon-General's office which task brought him into the very midst of the influenza pandemic of 1918. Reviewing the causes of respiratory diseases in army camps, he concluded that the greatest single factor in the prevalence of disease in certain camps and their absence in others was the natural susceptibility of the men. Aggravated by exposure, fatigue, lack of warm clothing, cold quarters by day, cold quarters and insufficient bedding by night, the susceptible recruits from the southern and western states succumbed to respiratory infection. He offers as the foremost remedial measure for future military concentrations a gradual introduction of civilians into army life. Men should be called to a semiactive reserve and become gradually accustomed to their new mode of life. This would permit of vaccination for typhoid and smallpox, serve as a hardening process and allow of the removal and isolation of the sick prior to entry into the severe duties of army life. His military career is reviewed elsewhere.

Doctor Vaughan served on medical and public health boards and committees too numerous to mention. He was a member of the Hygienic Laboratory Advisory Board from the date of its inception, February 23, 1903, and served continuously exactly twenty-six years, that is, to February 22, 1929, when his resignation was regretfully accepted. He served for several years as a member of the International Health Board of The Rockefeller Foundation, which has done so much toward the eradication of hookworm and malaria and has served as a stimulating influence in the establishment and extension of whole-time health organizations. He served for several years as Chairman of the Council on Public Health of the American Medical Association which Council did much to popularize health education. In 1903, rabies appeared in Michigan and at Doctor Vaughan's request, a Pasteur Institute was established at the University for the treatment of those who had been bitten by supposedly rabid dogs. For many years this was the only institution of the kind west of New York. Doctor Vaughan was a member

of the commission which examined the water supply at Chicago prior to the World's Fair and recommended that a private supply be obtained from Waukesha, Wisconsin, as the lake water at Chicago was becoming contaminated by the sewage from the city. In 1916, Doctor Vaughan was called to New York by Health Commissioner Emerson, and thus was brought in close contact with the devastating epidemic of poliomyelitis which invaded the city at that time.

As President of the American Medical Association in 1914, Doctor Vaughan gave a dissertation on public health, "The Service of Medicine to Civilization," which, together with his work, *Epidemiology and Public Health*, not only provides a compendium of knowledge, historical and present, with respect to disease prevention but contains many specific recommendations for improvement in public health administration which will be attained only in years to come. Ever mindful of the need of improving public health through personal health, he states that "if preventive medicine is to bestow on man its richest service, the time must come when every citizen will submit himself to a thorough medical examination once a year or oftener." Health departments must be manned with trained personnel and directed by executive officers distinguished for their knowledge of sanitation. There should be a national department of health with a member in the cabinet. Each state should have a hygienic laboratory equipped with able men supplied with facilities for the study of sanitary conditions and for the prosecution of scientific research. Members of the medical profession must carry on the fight against superstition and ignorance; must make the practice of medicine a virulent factor in the battle to prolong life and prevent needless suffering and premature death.

Doctor Vaughan believed that the health of the masses could best be conserved by improving the practice of medicine and by stimulating a more intimate relationship between patient and medical counsellor. He thus formulated his ideas as to the needs of the medical profession: (1) each physician should have at his disposal every scientific facility essential to make a correct diagnosis; (2) should have a well selected library; (3) should have laboratory facilities and x-ray; (4) there should be a minimum of interference with the relation which has so long existed between physician and patient and which, on the whole, has been so satisfactory to both.

These desiderata can be served by the construction and maintenance of community hospitals. His long years of experience as a consultant in the many small towns of Michigan has shown Doctor Vaughan the meagerness of the tools with which the rural practitioner was forced to work. Many states are now making rapid progress in providing counties and districts with well-equipped hospitals, noteworthy among which are the Carolinas, generously assisted by The Duke Foundation.

Epidemiology and Public Health records most completely Doctor Vaughan's experiences and services in this useful branch of medical science. Space will not permit of extensive reference to his work and we shall content ourselves by quoting a portion of a review of the second volume prepared by Milton J. Rosenau and published in the *Journal of the American Medical Association.*

"The book continues to be a thoroughly reliable encyclopedia of knowledge concerning the ills of mankind. It is not only a compendium of reference, but also a readable textbook. Technical details are avoided, obtuse scientific researches are clearly epitomized; in fact, the style has charm and directness, and the high lights of preventive medicine are brought out with dramatic force. The story of yellow fever, the drama of rabies, the romance of typhoid fever and the history of plague are told with telling effect.

"One of the outstanding features of the book that merits special commendation is the conservative, even cautious, attitude which the author assumes toward many of the recent scientific advances. While judiciously critical concerning recent laboratory researches, the work is fully alive to modern progress: it is up to the minute. Vaughan does not admit unreservedly the nutritional cause of rickets and pellagra, and adheres to the possibility of infection in scurvy and endemic goiter. It is refreshing to find our ignorance on many points so frankly and manfully stated: the histories of the medical sciences and the conquests of sanitation are not lessened by an acknowledgment of our limitations.

"Epidemiology has not yet been clearly defined. Vaughan's conception is broad and deep. He includes any information concerning a disease that throws direct or collateral light on its vagaries, or that may be useful in prevention or even in understanding its nature. He draws a sharp distinction between epidemiology and bacteriology, insisting that the former is very much broader and embraces the latter. He emphasizes the point, well known to epidemiologists, that some diseases were worked out and sufficiently well known to form the basis of rules and regulations for their prevention and control long before their causes had been discovered. He cites cholera as an example, and he might have added yellow fever and other infections. The historical side of each infection is illuminatingly drawn, and the statistical side is illustrated with special examples taken largely from American experience."

—Henry F. Vaughan,
Detroit.

Editor's Note:

Dr. Vaughan's ability to inspire with lasting enthusiasm was not limited to the classroom or the rostrum. Of this the careers of his five sons bear eloquent testimony. Three have been physicians and one is a Doctor of Public Health.

His eldest chose tuberculosis as his special study, and at the time of his death was the director of tuberculosis activities in Detroit.

His second, a well-known surgeon, has contributed to our knowledge of cancer through immunologic investigations.

The third son has espoused the classics and the romance languages in which he now holds a professorship in the University of California.

The fourth has selected Public Health as his life's work. His contributions in this field have already won him the Presidency of the American Public Health Association.

The fifth son is devoting his endeavors to allergy and clinical immunology.

Thus, at least four of the lines of Dr. Vaughan's greatest interest are being followed by his sons. Dr. Zinsser has said that it is questionable whether activities so diversified can again be successfully combined in the life of a single individual. It has taken the combined efforts of five sons to continue in a modest way all of the interests that were so easily carried by the father.

DOCTOR VAUGHAN'S CONTRIBUTION TO PREVENTIVE MEDICINE*

TO MANY in this room and, in fact, to nearly all persons interested in public health work, the life of Victor Clarence Vaughan has been an inspiration. Born in 1851 in Missouri, Dr. Vaughan became a pioneer in sanitation and public health early in his career. He continued this work through his entire life, first a pioneer, then a student and teacher, and finally master of the science. Although Dr. Vaughan was versatile and spent many hours in allied sciences, his greatest interest was always in public health from the very beginning to the end. It was indeed a privilege to sit at the feet of the great scientist and hear his teachings in hygiene and preventive medicine. No one could listen and not be impressed. Dr. Vaughan, through his own personal efforts, and through his teachings to his thousands of pupils and followers, has probably saved and prolonged the lives of more human beings than any other one man who ever lived.

Fortunately many of the great teacher's thoughts were put in print and are now available as textbooks and reference books. One of his early writings was a prize essay on *Healthy Homes for the Working Classes.* This pamphlet was awarded the prize by the American Public Health Association in the early days of Dr. Vaughan's career. Written in plain language so that it might be understood by anyone who could read it, the little book has been of great value to the people. Several teachers of my acquaintance have used it as a text for lectures in hygiene.

Dr. Vaughan's accomplishments in preventive medicine were many and noteworthy and an account of them would take so much time that it would not seem just to attempt it at this time. A mere mention of some things done by our deceased friend, things which aroused the attention of the entire world, may be in place here.

Dr. Vaughan established, in 1887, the first laboratory of hygiene in the United States.

Before the discovery of the typhoid bacillus by Eberth, Dr. Vaughan made *Experimental Studies on the Causation of Typhoid Fever* in the same year that his hygienic laboratory was established.

Dr. Vaughan discovered and described tyrotoxicon, a poisonous substance elaborated in cheese. This important discovery was made during an investigation of an outbreak of cheese poisoning at Milan, Michigan.

Model Diets, published in 1887, was forerunner of the many treatises published since then on balanced diets and contained much of the present information, except on the subject of vitamins.

Dr. Vaughan made the first survey of drinking water in the State of Michigan. This was done before bacteriologic methods were known and the methods that had to be relied on were field and chemical laboratory methods.

*Courtesy of Director of Alumni Relations, University of Michigan.

In 1887, at the International Medical Conference, the etiology of diphtheria was said to be sewage and water pollution. Dr. Vaughan boldly stated his conviction at that very important conference at which the best minds in the world were present, that "diphtheria is not a filth disease but is induced by a specific poison." This remarkable statement was made before Klebs and Loeffler had made their announcement of the discovery of the diphtheria bacillus.

In August, 1898, Dr. Vaughan was appointed a member of the Typhoid Commission. This Commission was appointed to investigate the unusual prevalence of typhoid and the excessive death rate from that disease among the American soldiers during the war with Spain. The other members of the Commission were Dr. Shakespeare and Dr. Reed. Drs. Shakespeare and Reed both died before the completion of the task and it was left to Dr. Vaughan to complete it. The results of his labors were finally published in two immense volumes and they established two monumental facts:

First, the fly transmission of typhoid.

Second, the direct contact spread of typhoid.

Dr. Vaughan's war record was one of accomplishment in preventive medicine and public health. He entered the service in 1898 at the time of the Spanish-American War and during that service his most outstanding work was done on the typhoid commission as already described. He also did commendable work in the prevention of yellow fever during that service. He contracted the fever himself but met it bravely and fought it successfully.

During the World War his services to his country were invaluable. Established with headquarters at Washington, he had charge of the preventive medicine work in all of the camps and was in general charge of all of the epidemics. He described his experiences subsequently in a very valuable work on epidemiology.

For thirty-six years of his life Dr. Vaughan was active as President of the Michigan State Board of Health. He was appointed by Governor Begole in 1883, ten years after the establishment of the Board, and remained a member under several subsequent administrations. In 1919 when the State Legislature abolished the State Board and put in its place a single commissioner with an advisory board, Dr. Vaughan no longer remained on the board. During Dr. Vaughan's service on the Board of Health, that institution grew from a small beginning to its present organization, which is considered second to none in the United States. Dr. Vaughan suggested and introduced many activities, and it can truthfully be said that his name stands as the foundation stone of public health work in the State of Michigan. I have given but a very brief résumé of some of the works and deeds of Victor C. Vaughan. To have known him was to have loved and admired him, to have worked with him was a rare privilege. No one could come into close contact with Dr. Vaughan without realizing that he had profited by such contact. A complete compilation of his accomplishments and discoveries would be a compilation of the most noteworthy accomplishments in public health work during the past sixty years. The name of Victor C. Vaughan is a synonym for progress in public health.

—Guy L. Kiefer,
Lansing, Mich.

DR. VICTOR C. VAUGHAN

Member of the Advisory Board of the Hygienic Laboratory

FOLLOWING the creation of the Advisory Board of the Hygienic Laboratory authorized by Act of Congress, July 1, 1902, Doctor Vaughan was appointed as a member of the board February 23, 1903. His appointment was especially fitting because of the beginning public health movement of the time and because of the training and rich experience he had had as a physiologic chemist, epidemiologist, and public health official.

The unfortunate outbreaks of disease attending the Spanish-American War, the increasing menace of diseases, especially typhoid fever and yellow fever, and the rapidly developing science of bacteriology had all contributed to a new awakening of public interest in health affairs.

Under the law just mentioned the Public Health Service had been recognized in the 109th year of its existence; the Hygienic Laboratory had been given definite status in law and organized for public health research. The opportunities in this field were great, but from the standpoint of facilities these were lean years. The relative importance of investigations to be undertaken and the methods of making them, therefore, were of prime importance. It was the special province of the Advisory Board to consider these matters.

Problems of plague and hookworm infection had already engaged the Hygienic Laboratory. Systematic studies of typhoid fever next claimed attention. In this field Doctor Vaughan was especially helpful from 1906 to 1910. By reason of his broad experience in investigations of the outbreaks of this disease in army camps in 1898, he made many valuable suggestions regarding the conduct and interpretation of these studies. They were the first extensive epidemiologic investigations of typhoid fever among the civil population, and may be said to have marked a new era in the control of excreta-borne infections.

In the meantime Kastle was working in the Hygienic Laboratory on the ferments of the blood. Here again Doctor Vaughan's knowledge of biologic chemistry was requisitioned. In the extensive studies of Rosenau and Anderson on anaphylaxis, also, he was profoundly interested. This new phenomenon promised to have an important bearing on problems of immunology. Its spectacular demonstration before the Advisory Board in the spring of 1907 was the beginning of consideration of the subject by the board for a long period. Doctor Vaughan had already been investigating the split products of proteins, and had extracted from various proteins toxic substances which gave rise in animals to a symptom-complex not unlike that of typical anaphylaxis.

In this as in other subjects he advanced original hypotheses to stimulate interest and study on the part of laboratory workers. It was the custom

regularly to have members of the board address student workers in the Hygienic Laboratory. In a particularly happy manner Doctor Vaughan would present his hypotheses, assuming, as he said, that his hearers were trained to consider phenomena not yet fully understood and to discriminate between proved facts and data requiring confirmation. For over twenty-five years he remained a member of the Advisory Board. During this formative period many fundamental problems received attention in the Hygienic Laboratory. These related to cholera, plague, pellagra, poliomyelitis, typhoid fever, tuberculosis, typhus fever, tularemia, and other public health matters.

In company with Professor W. H. Welch and Assistant Surgeon-General J. W. Kerr he visited places in the South, including Milledgeville, Georgia, in 1917, where at the time Goldberger's epoch-making studies of pellegra were being conducted. By these personal inspections it was possible not only to suggest additional methods, but to verify progress already made.

In all the years of his association with the Hygienic Laboratory he rarely failed to attend a meeting of the Advisory Board. Notwithstanding the great demands upon his time and energies as teacher and research worker in his own institution, he readily responded to orders convening meetings of the board.

For these important services only nominal compensation could be allowed. Under law it is impossible to do so adequately. Doctor Vaughan's long tenure of office under these conditions is but another evidence of the willingness of men of eminence to render public service without thought of remuneration other than the personal satisfaction in the good accomplished. He was in the highest degree a public servant. He was more. By reason of his scientific attainments he was an invaluable advisor and because of his character he was an inspiration to younger men working for the public good. As a friend he endeared himself to those immediately responsible for the development of public health research—a major function of the Federal Government.

—Hugh S. Cumming,
Washington, D. C.

A FIGHTER FOR THE CAUSE OF HEALTH

The Military Record of Colonel Victor C. Vaughan

DR. VICTOR C. VAUGHAN in his delightful autobiography *A Doctor's Memories* remarks, "My life has been determined by heredity and environment." His grandfather, William Dameron, saw service in the Black Hawk War with the rank of Colonel. His father, John Vaughan, for a time served in the Regular Army. Four years of the most impressionable period of Doctor Vaughan's childhood were spent amidst scenes of internecine strife in Missouri during the Civil War, which taught him, in his own words, "to hate war and to love peace so dearly that I have been willing to do my small bit of fighting for it." From this ancestry and environment Vaughan received the impulses which directed his career along many lines of military activity, all of which were calculated to ameliorate the horrors of warfare. The hereditary trend was passed on to his sons, all five of whom served as commissioned officers during the World War, three going to France. The eldest, Major Victor C. Vaughan, Jr., Medical Corps, lost his life by drowning in France after the Armistice.

Having graduated in medicine, having filled important positions in the University of Michigan, and while dean of the Medical School, Doctor Vaughan left the scholastic quiet to do his share during the Spanish-American War in 1898. After the proclamation of war he was at the first anxious to enlist. His eagerness for service is shown by a yellowed sheet in the files of the Surgeon-General's office, which reads as follows:

> "University of Michigan
> Department of Medicine and Surgery
>
> Ann Arbor, March 26, 1898.
>
> Geo. M. Sternberg, M.D., LL.D.,
> Surgeon-General, U. S. A.
>
> Dear Dr.:
>
> If there be any need of volunteers for the Medical Service and I am not too old, I wish to be counted in.
>
> I suppose that you have your hands full just now.
>
> Yours
> V. C. Vaughan."

Immediately following a patriotic speech made before the students of the University of Michigan, he was appointed by Governor Pingree on June 9, 1898, as Surgeon of the Thirty-Third Michigan Volunteer Infantry with rank of Major, and was mustered in the same day. He proceeded to Camp Alger, Va., for duty, sailing with his command for Cuba a few days later and landing

near Siboney. The boat in which he disembarked capsized when approaching shore and the occupants reached land by swimming. Major Vaughan shared this unpleasant experience with his college associate, Major Charles B. G. de Nanerede, Division Surgeon.

On July 1, 1898, Major Vaughan was with a command suffering several casualties which necessitated the application of first aid dressings under fire. His efficient services in this situation were specially mentioned by his brigade commander, Brig.-Gen. Henry M. Duffield, as a result of which he received a citation (Silver Star) for gallantry in action under date of September 17, 1924. As Major Vaughan says in his *Memories*, "Uncle Sam may be slow in conferring honors, but he seldom wholly forgets."

While at Siboney, Major Vaughan suffered from a very serious attack of yellow fever and for a time his life was despaired of. Soon after his recovery he returned to the United States via Tampa, Fla., on duty with convalescents, later proceeding in charge of patients to New York. Under date of July 8, 1898, he had been appointed Major and Division Surgeon, U. S. Volunteers. On arrival in New York he received orders to report to the Surgeon-General in Washington for conference regarding the duty prescribed by the following order:

"War Department,
Adjutant-General's Office,
Washington, August 18, 1898.

"Special Orders, }
No. 194 }

"40. A board of medical officers, to consist of Maj. Walter Reed, surgeon, U. S. Army; Maj. Victor C. Vaughan, division surgeon, U. S. Volunteers, and Maj. Edward O. Shakespeare, brigade surgeon, U. S. Volunteers, is appointed to meet in this city at the earliest date practicable for the purpose of making an investigation into the cause of the extensive prevalence of typhoid fever in the various military camps within the limits of the United States, under such instructions as it may receive from the Surgeon-General of the Army. The board will call the attention of the proper commanding officers to any insanitary conditions which may exist at the camps visited by it, and will make recommendations with a view to their proper correction. The report of the board will be forwarded to the Surgeon-General as soon as practicable after the completion of the investigation contemplated.

"Such journeys as may be required under the above order are necessary for the public service.

"By order of the Secretary of War:

"H. C. Corbin,
"Adjutant-General."

In carrying out these instructions the board visited the following camps on the dates stated: August 20, Camp Alger at Dunn Loring, Va.; August 26, camp at Fernandina, Fla.; August 28, Camp Cuba Libre at Jacksonville, Fla.; September 7, camp at Huntsville, Ala.; September 10, Camp George H. Thomas at Chickamauga Park, Ga.; September 14, camp at Knoxville, Tenn.; September 30, Camp Meade, near Harrisburg, Pa. Careful investigations were made at these encampments along all of the lines then known to epidemiologic science. Patients who had been transferred elsewhere were methodically

traced. One of the fundamental conclusions of the board was to the effect that little malaria had occurred and that the prevailing sickness had been typhoid fever, which was either unrecognized or else diagnosed very late in its course. About 20 per cent of the men at the national encampments were thought to have suffered from this disease. In view of the prevalence of typhoid fever at that time throughout the United States, it was considered probable that nearly every regiment had brought to camp one or more cases of typhoid in the incubation or prodromal stage, and that the spread of the disease among the troops had been mainly from camp pollution—soil, latrines, blankets, clothing, tentage, etc., and by direct contact from man to man. Flies were considered to be important spreaders of infection, from the poorly kept latrines to exposed food. Water pollution was not deemed an important factor in the dissemination of the disease through these camps. The progress of typhoid infection was shown to be characterized by a series of company epidemics. In view of our present knowledge of the importance of carriers and missed cases in the spread of localized epidemics originating in the kitchen, it is interesting to note that this idea had not come into being at the date of these investigations and was not even hinted at in the report of the board.

The findings of the Reed-Vaughan-Shakespeare board led to very marked improvements in our methods of handling large bodies of men in camp and of treating them in hospitals, thereby contributing materially to the success of preventive medicine before and during the World War. One conclusion of the board, since realized to a large degree, was that "greater authority should be given medical officers in questions relating to the hygiene of camps."

A preliminary abstract of the Board's work was published by the Government in 1900. Major Vaughan labored on the final assembling and analysis of the voluminous data until June 30, 1899, on which date he was honorably mustered out of the Federal service. After this he voluntarily continued to work on this subject until January 31, 1900. Major Shakespeare, whose extensive experience with epidemics of cholera and typhoid had been of great value during the investigations, died suddenly on June 1, 1900. Major Reed, whose time was much occupied with his epochal yellow fever researches, had the report in charge until his death on November 23, 1902, at which date it was still unfinished. The completion of the manuscript and supervision of its publication by the Government Printing Office in 1904 with the funds appropriated by Congress was carried out by Major Vaughan. The finished work in two large volumes entitled *Report of the Origin and Spread of Typhoid Fever in U. S. Military Camps During the Spanish War of 1898* is a masterpiece of painstaking analysis and bears the following words of appreciation:

> "War Department,
> Office of the Surgeon-General,
> Washington, November 1, 1904.
>
> * * * * *
>
> "Professor Vaughan, whose special fitness for this work is well known to the medical world, has labored unceasingly to put the full report in such shape as to make it a classic not only for the study of the epidemiologist, but also for the use of the entire medical profession.

"I desire to express my appreciation of the successful results of his painstaking and intelligent work.

"C. L. Heizmann,
Assistant Surgeon-General, U. S. Army,
Acting Surgeon-General."

Doctor Vaughan's service in the interest of typhoid prevention did not cease with the publication of the work of the Commission. In 1908 the Medical Reserve Corps of the Army was organized by Surgeon General R. M. O'Reilly, and Doctor Vaughan was commissioned as 1st Lieutenant with rank from July 5, 1908, being one of the first recruits in accordance with General O'Reilly's policy of having the corps headed by some of the outstanding physicians and surgeons in the country. Following the report of Major F. F. Russell regarding the practice of antityphoid inoculation in Europe, Doctor Vaughan was called into active service December 5 to 12, 1908, and was detailed as a member of the board appointed to consider this report. Aside from the Surgeon-General and Major F. F. Russell, who was recorder, this board consisted of the following members of the Medical Reserve Corps: Dr. Wm. Councilman, Dr. John H. Musser, Dr. Alexander Lambert, Dr. Simon Flexner, and Dr. Wm. S. Thayer. The board found that antityphoid inoculation was a safe and practicable method for diminishing the amount of typhoid both in peace and war; it recommended its use among all forces in time of war and its immediate introduction in the hospital corps and army nurse corps and among volunteers from other branches of the service. The recommendations of the board were approved and formed the basis of G. O. 10, War Department, 1909. A little later antityphoid inoculation was made compulsory for the entire Army and Navy. The practice of typhoid vaccination is considered to be one of the most important factors which led to the greatly reduced incidence of the disease in the Regular Army and to its relative infrequency among all classes of military personnel during the World War.

Although at the outbreak of the Spanish-American War in 1898 Doctor Vaughan had raised the question as to whether he was "too old" for military duty, we find no record that this issue was again raised by him when, nineteen years later, the United States embarked on its much greater venture in the World War. As in 1898, he was impatient for service. Doctor Vaughan was promptly called to the assistance of the country when war appeared imminent. During the winter of 1916-1917, when it became increasingly probable that our country would be drawn into the conflict, the National Research Council of the National Academy of Sciences, including on its roll eminent men from every branch of scientific endeavor, began to gather information which would be of use in case of an emergency. Doctor Vaughan looked after medical affairs for the Council and made frequent visits to Washington and New York, being in close touch with General Gorgas and the other personnel of the Surgeon-General's Office. Among the subjects considered were sterilization of drinking water, ventilation of barracks, uniform clothing, rations, typhoid and smallpox vaccination, detection of disease carriers, treatment of the gassed, protection of the ears from effects of high explosives, provision of laboratories, bacteriology of wounds, and the procurement of medical supplies. Later the

National Research Council acted as the scientific component of the Council of National Defense. War was declared on April 6, 1917. Already a lieutenant in the Medical Reserve Corps since 1908, Doctor Vaughan was called to active duty April 26, 1917, having been promoted to Major on April 9, 1917. He was assigned to duty with the medical division of the Council of National Defense where he continued to be engaged with many of the problems listed above, and in addition conferred frequently with General Gorgas and served on a committee to scrutinize the qualifications of the numberless applicants for commission in the Medical Department. In August, 1917, he was definitely relieved from duty with the Council of National Defense and assigned as head of the Communicable Disease Section of the Division of Sanitation in the Surgeon-General's Office. In this position he had immediate supervision over the current reports of communicable diseases from all the camps and hospitals in the United States, compiling statistics, developing graphic charts, analyzing data, and investigating methods of disease prevention. He emphasized the fact that a much greater prevalence of respiratory diseases was found in those camps where the population was drawn largely from rural communities. With the assistance of Capt. George T. Palmer, he prepared a valuable article entitled *Communicable Diseases in the National Guard and National Army of the United States During the Six Months From September 29, 1917, to March 29, 1918*, which was published in the JOURNAL OF LABORATORY AND CLINICAL MEDICINE, Vol. III, August, 1918.

During his period of active duty, Colonel Vaughan made a great number of inspections relating to medico-military activities. In June, 1917, Col. Frederick P. Reynolds, Medical Corps, and Major Vaughan proceeded under official orders to Ottawa, Montreal, and Quebec for the purpose of reporting upon the administrative and sanitary procedures of the Medical Department of the Canadian forces. One of the most important services rendered by Colonel Vaughan had to do with the numerous sanitary inspections he made during the latter half of 1917 and the spring of 1918. On many of these journeys he accompanied General Gorgas. Measles, pneumonia, and meningitis were then causing much anxiety throughout the country. Colonel Vaughan's large experience was of much value in these troublesome times and the prestige and authority of his name assisted greatly in maintaining morale and in supporting the policies of General Gorgas. Among the points visited between September, 1917, and February, 1918, were Camps Funston, Beauregard, Pike, Bowie, Sevier, Doniphan, Wheeler, and Custer. Other inspections were made during the influenza epidemic in the fall of 1918. To quote his own words:

"I went to Camp Devens as soon as influenza was reported and the realization of the utter helplessness of man in attempts to control the spread of this disease depressed me beyond words. We are inclined to boast that the age of pestilence has passed, but, with a fair acquaintance with the history of epidemics, I dare say that the world has never before known a pestilence more widespread, more intensive and appalling in its progress, or more destructive to life, than the epidemic of influenza which apparently came into being and grew in violence as the World War passed through its final stages. It seemed

that Nature gathered together all her strength and demonstrated to man how puny and insignificant he and his forces are, with all his murderous machinery, in the destruction of his fellows. We have not passed beyond the age of pestilence. Much has been done in man's struggle against disease, but greater things are to be done. There has been no armistice signed between man and disease. Influenza, pneumonia, cerebrospinal meningitis, poliomyelitis, and tuberculosis, are still using weapons against which our defense is quite inadequate. They employ strategy in approach and attack which we do not fully understand. In this war against epidemic disease we must not permit the elation due to past victories to make us less careful and thorough in preparation for the battles of the future."

Between inspections Colonel Vaughan was engaged in duties connected with the study of current epidemiologic records received in the office of the Surgeon-General. By par. 161, Special Order 118, War Department, May 20, 1918, he was made a member of a board of medical officers appointed to investigate the nature, cause, prevention, and treatment of pneumonia and its complications in the camps within the United States. The other members of this board were Col. Deane C. Howard, Col. Frederick F. Russell, Col. William H. Welch, and Contract Surgeon Rufus Cole. During this investigation he visited Camps Gordon, Devens, and Wheeler, and General Hospitals No. 6 at Fort McPherson, Ga., and No. 12 at Biltmore, S. C.

In 1922 Colonel Vaughan, assisted by Henry F. Vaughan and George T. Palmer, published an extensive and notable work entitled *Epidemiology and Public Health*. The discussions regarding typhoid fever, malaria, measles, pneumonia, influenza, and cerebrospinal meningitis are to a considerable extent based upon Colonel Vaughan's experience in the Army and represent his matured thought on diseases which have played such a vital part in our wars. The chapters devoted to these subjects contain careful analyses of military experiences which should be studied by every medical officer.

Colonel Vaughan was promoted to the grade of Lieutenant-Colonel with rank from February 11, 1918, and to the grade of Colonel, with rank from April 30, 1918. He was honorably discharged from the Federal service February 14, 1919.

In appreciation of his services to the Allied cause, the Republic of France honored him with the decoration of Chevalier Legion d'Honneur.

Colonel Vaughan was a man of pleasing personality, mild-mannered, yet inflexible in carrying out the policies which he considered necessary to attain his aim of preserving health. A long and honorable record, the prestige acquired through his addresses and publications, and the energy displayed in prosecuting investigations, together rendered his services of inestimable value to the Surgeon-General during the trying period of the World War. His example of devotion to the public welfare is an inspiration to physicians both in and out of the military service. His worth to his country was recognized by the award of the Distinguished Service Medal with the following citation:

"Colonel Victor C. Vaughan, United States Army. For exceptionally

meritorious and conspicuous service. During his service in the Office of the Surgeon General his contributions of advice and information have been of great value to the Army in connection with the control of communicable diseases. During the recent epidemic of influenza, in particular, his work was of extreme value."

—*Merritte W. Ireland,*
Washington, D. C.

OUR COLLEAGUE, DOCTOR VICTOR CLARENCE VAUGHAN*

TO BUT few is it given to leave upon the world so strong and enduring an impress as that of our colleague, Victor Clarence Vaughan. His life-curve, which stretched out to near fourscore years shows almost to the end an ascending arc and one which reached to high levels of attainment.

When his more strenuous activities were already behind him, out of a rich experience, with abundant leisure, and near the libraries of the national Capitol, he began the writing of his *Epidemiology*, through which he hoped to project himself into the future. This authoritative work he was spared to complete and to see issue from the press; and then with the retrospection that comes in the sunset of life, while yet in full possession of his intellectual powers and with a vivid memory scarcely impaired, he set down the story of his eventful life. In his *A Doctor's Memories*, with greater success than has been given to most others he was able to impart to the printed page of his life story the intensely human side of his personality and to leave with his readers a measure of the peculiar personal charm of the Vaughan we knew and loved.

And what a circle of friends he had made to read his story! There was the group of university workers, almost the entire medical profession, the army, the scientists of the government bureaus, the medico-legal fraternity, and that wider circle with which he had touched elbows on his extended travels both in this country and abroad.

My colleagues upon this memorial program have already touched upon the professional life of our friend, and it has been left to me to speak of Vaughan, the man, apart from the work in his chosen field.

In his married life Vaughan was peculiarly blessed, and his family circle was to him a continual source of inspiration and help. The five sons seemed to inherit the high ideals of their parents, and each carved out for himself a career of usefulness in the intellectual field, four of them in the medical profession, and in their success Vaughan had a father's joy and pride.

Hardly less deep and strong in him than the love of home was the love of country. While a boy on a Missouri farm during the Civil War between the States, he early became familiar with the horrors of war and especially with the brutality and license of guerrilla bands in border warfare which culminated in the raiding of his home. An intense hatred of war was thus bred in him, but one which never blinded him to his duties as a citizen of our common country; and so in both the Spanish-American and the World War he promptly volunteered for active service. In 1898 both by precept and example he stirred the student body into a blaze of patriotic fervor, and as major in the medical corps of the army he served with distinction through the Santiago campaign, in which he nearly succumbed to an attack of yellow fever.

*Courtesy of Director of Alumni Relations, University of Michigan.

In the early phases of the World War, as an official of the National Security League upon the campus of the University, he preached the necessity of making early preparation for our entry into the war, the delay of which he regarded as a national disgrace. So soon as we had declared a state of war to exist, not only he but each of his five sons promptly entered upon active service. It may well be doubted if the muster rolls of the army in that war offer a more remarkable example of the service of a single family, for the Vaughan family had in the service a colonel, two lieutenant-colonels, a major, a captain, and a lieutenant, and the eldest son, Major Victor Clarence Vaughan, Jr., died in the service in France.

In the World War, Vaughan was soon assigned to the medical division of the Council of National Defense in Washington, and it became his duty to recruit a body of one thousand physicians to be sent at once to the British Army for special service training and to be later transferred to the American Army when it should have arrived in France. There was a real danger that the poorly trained and the less competent physicians would apply and be given places in this élite corps which called for men of superior training and ability. Few men in the country had so wide an acquaintance with the medical profession as Vaughan had. He went personally to the men of scientific training with established reputations and appealed to them to make the sacrifice which would be necessary to accept service in this corps. Believing in Vaughan as they did and observing his example, men of the highest attainments were induced to join, and Vaughan's work thus had much to do with the splendid record made by our Medical Corps.

With Vaughan, devotion to research in science amounted almost to a religion. When the opportunity had come to him to develop the Medical School at the University, he determined that none but men of productive scholarship should be called to the vacant positions, and against much opposition in a day when such qualification was not generally regarded as essential, he succeeded in building up a medical school which took front rank and became the pattern for others. An enthusiastic research worker himself, he was always ready to aid his associates by advice and encouragement, and his ever ready sympathy extended to his colleagues in the other Colleges and Schools of the University. After his retirement from the Medical School he directed for some years the Medical Division of the National Research Council in Washington.

With a view to stimulating research at the University of Michigan he bore the leading part in founding the Research Club, which celebrated its quarter-century anniversary in 1925, and which indirectly has played an important rôle in giving the University the standing which it has today. The first informal meeting of what was to become the Research Club was held at Vaughan's home in Ann Arbor where he was made Chairman of a Committee of Organization, and at the first formal meeting held in the home of Dr. Lombard he was elected President of the Club and continued to hold that office throughout the critical early period of its history.

Outside the Medical School and the monthly meetings of the Research Club, Vaughan found his most intimate social contacts as a member of the Scientific Club, the oldest faculty club on the campus which forty-six years

ago he was instrumental in founding. Its membership has been limited to twenty men who must be members of the faculty, and it has met fortnightly at the homes of members for social intercourse and for intimate discussion of those problems in which its members are most keenly interested. Unless absent from the city it was rare for Vaughan to miss a meeting of this club, and he brought to it a never-failing good cheer, a fund of humor, and a wealth of stories out of his varied experiences. Discussion of the paper over, Deans Vaughan and Cooley became the center of an intimate exchange of views on topics of the day and especially the campus, and of anecdotes drawn from experiences in many fields. Here as nowhere else this group of his colleagues came to know and love the man of high ideals, of generous impulses, of straightforward methods, and of keen interest in his fellow workers both in the University and throughout the country. His passing from among us has left a void of which we are today keenly aware and one which is not likely to be filled.

—*William H. Hobbs,*
Ann Arbor, Mich.

DR. VICTOR C. VAUGHAN AND HIS RELATIONS TO THE NATIONAL RESEARCH COUNCIL

DURING the Civil War President Abraham Lincoln stimulated the formation of the National Academy of Sciences which included the leading American men of science who gave freely of their advice on all technical matters to the President and to Congress. This body continued its scientific deliberations during the years of peace from 1863 to 1916 and was recognized as the highest court of appeal, although infrequently called on officially by the government to settle vexed scientific questions.

It became evident to most thinking men in 1916 that the United States of America was destined to be involved in the World War which was sweeping Europe. Although our government had been pledged by President Wilson to a policy of neutrality, it seemed criminal to remain deliberately unprepared for entrance into the arena of war across the seas.

The National Academy of Sciences enjoys the privilege of governmental affiliation without governmental control. As a chartered body it was free to think and to prepare itself for the inevitable which the Government officially must apparently ignore. In April, 1916, the Academy by unanimous vote tendered its services to President Wilson who at once accepted them. It took further a wise step in enlarging its selective body through a larger and more democratic subsidiary which it christened The National Research Council. This Council was designed, and has since proved to be, a clearing house for all scientific questions, both national and international, in its several divisions which cover the entire realm of science.

Dr. Vaughan, as ever far-sighted and wise, was one of the first members of the Academy to bring into existence this active working body which through its representation in all national societies was best suited to find the man most fitted for each problem as it arose. He was a member of the first executive committee which made the Research Council alive to its country's needs during the trying war years of 1916-1919 and the first chairman of the Committee on Medicine and Hygiene. With characteristic energy and with his knowledge of what war could mean from the medical standpoint, Dr. Vaughan undertook to ascertain and to formulate the problems of most vital significance in the care of troops in camp and in the field. His intimate friendship with General Gorgas and other governmental officers made it possible for him to obtain their unofficial expressions of opinion as to what the mobilization of a hitherto unprecedented number of men would mean in safeguarding them from disease.

Dr. Vaughan not only formulated the vital problems at issue but at once undertook to obtain the best available advice and aid in solving them. No one was better informed as to active centers of research and authority in the

whole field of medicine in the many active university, governmental, and private laboratories. He has listed in his autobiography some of the problems needing solution as follows:

1, The best method of sterilizing drinking water for troops in cantonments, on the march, and on the firing line; 2, the ventilation of barracks; 3, soldiers' clothing; 4, rations; 5, the best methods of vaccination against both smallpox and typhoid fever; 6, the treatment of wounds; 7, the treatment of poisoning with deadly gasses; 8, the provision of supply of medicines; 9, the protection of the ear against high explosives; 10, the detection of disease carriers and their treatment; 11, provision of diagnostic laboratories in both equipment and personnel, and 12, the bacteriology of wounds.

It might appear from Dr. Vaughan's recital of these problems that the regular officers of army, navy, and public health service not only appreciated these problems but knew best how to solve them. No one outside governmental service could, to be sure, understand so well the needs and responsibilities that would devolve on those in active service, but the very solidarity and responsibility of these services shut them off from constant contact with the perennial fountain heads of progress, in universities and civilian life, where the delicate growth of research is fostered by freedom from less formalized methods of life.

The two newly organized civilian advisory bodies, the National Research Council and the Council of National Defence, were in a particularly advantageous contact position between official need and responsibility and nongovernmental knowledge and research ability. No one could appreciate better than Dr. Vaughan both sides of the question, no one was better fitted through charm and strength of personality to bring about the delicate adaptations which the situation demanded.

As a result of these adaptations for something like a year (1916-1917) the medical forces of the United States found themselves prepared in an amazing degree for their responsibilities when this country entered the war. It is not within our province to consider the army record of Dr. Vaughan during the World War; as chief of the Division of Epidemiology all major questions of the health of our troops came under his wise surveillance. He still continued his unofficial interest in the National Research Council during its entire period of war organization 1916-1919.

When the National Research Council entered in its permanent organization in 1919 Dr. Vaughan was as ever a guide and counsellor not only in its Medical Division but in its larger relations. He remained intimately connected with it throughout the remainder of his life. When relieved of his university responsibilities in Michigan, Dr. Vaughan was fortunately able to serve actively as the Chairman of the Medical Division for two different years (1921-1922; 1925-1926). As the first chairman of the permanent organization he was able to shape many of the important policies which have made the medical division useful, notably in the establishment of the fellowships in medicine for which he was largely responsible.

It seems fitting indeed that the last active duties of one whose life was filled with a multiplicity of personal and public services should have been in Washington at the very center of our national interest, and particularly connected with an organization destined, we believe, to become a clearing house for forwarding research both national and international in scope. It served to emphasize the productive scholarship and scientific eminence for which Dr. Vaughan will always be remembered.

—*Frederick P. Gay,*
New York.

AN APPRECIATION*

ACCEPTING the definition of genius as "remarkable aptitude for some special pursuit," a painstaking biographer would find himself at once and irreconcilably at variance with Dr. Vaughan's estimate of his own qualities. He writes in *A Doctor's Memories*: "I am not a Chinaman and do not practice ancestor-worship, but I do respect my forebears and acknowledge my indebtedness to them. They have transmitted to me no spark of genius. I am not aware that any of them ever possessed such a gift, be it in form of a blessing or a curse. . . ."

His descent in the maternal line was from French Huguenots who came to this country in 1699, settled at first on the James River, and eventually became dispersed through Virginia and North Carolina. His family so far as he could ascertain, "bred constantly plain people, honest according to the standards of its several generations and rebellious to dictation from others in religion, morals, and politics."

Ample confirmation of the final sentence in the preceding quotation from the "Memories" is furnished by an episode in his career at the University of Michigan. While the matter of promotion was pending in the Board of Regents, the charge of atheism was introduced. To Dean Palmer, who in agitation revealed this and suggested the importance of denial, he said: "Tell the Board that I decline to make confession of faith to them. The position concerns the teaching of science and has no relation to religious belief."

And resistance to coercion was natural and ingrained. An ancestor fought in the Revolution, a relative had part in the Black Hawk War, another was surgeon in the Confederate Army, and his father served for a time in the United States Army.

Dr. Hubert Work, president in 1920, of the American Medical Association, is quoted as saying, "You all know that Dr. Vaughan is already known as the greatest man in American medicine in Michigan, and a great many of us believe he is the greatest man in American medicine today." Obviously appraisal of the values of such a life must be a composite product and can from no particular pen, however facile, appear even measurably just and complete. Much less may an estimate from the present writer, all too ill equipped for the service, fulfill requirements and be satisfying. The opportunity is welcomed, however, to pay tribute to this extraordinary man, my friend. I admired him and to employ a good old-fashioned word, "liked" him. Every confidence or suggestion he ever gave me was prized and for many, many years I felt definitely at home in his company.

My memories of Dr. Vaughan hark 'way back to the winter of '76-7, when young, verdant, and inadequately prepared, I became a student in the Medical Department of the University of Michigan. He was also young—five years

*Courtesy of the Journal of the Michigan State Medical Society, J. H. Dempster, Editor.

my senior—but he had a cultural and pedagogic background. In passing, it may be mentioned that nothing whatever of this was displayed in his attitude toward students. Indeed, his sympathetic understanding and considerateness related him perhaps more closely with them than with the teaching staff of the department, all older and highly worthy men who had arrived. However, he was at that time definitely on his way to distinction.

From Mount Pleasant College, Missouri, where he was graduated in 1872 and taught Latin and chemistry until 1874, lured by Douglas and Prescott's *Qualitative Analysis* which decided in his mind the long-debated question whether to choose the classics or science for his life work, he came to the University of Michigan for postgraduate study. There he acquired in 1875 the degree of Master of Science, in the following year that of Ph.D., and in 1900 an LL.D.

He entered the Medical School in 1876 and was graduated two years later. Before matriculation therein he had acted as voluntary and temporary demonstrator in the dissecting room. His appointment as instructor in physiologic chemistry followed the enforced retirement of Professors Douglas and Rose which came about through careless business methods and was, he declares, "a regrettable and sorrowful affair."

In his first appearance before the student body he tactfully avoided any subject in chemistry and spoke on "The Structure and Function of the Kidney." Potentially hostile partisans on both sides of the controversy were placated and all went out singing, "He's a Jolly Good Fellow." Commenting upon this in "Memories" he writes: "During the forty-five years that I continued to lecture to medical students not one has ever shown me the slightest disrespect in classroom or elsewhere."

During my brief student days in the University he was instructor in the chemical laboratory over which presided the distinguished Dr. A. B. Prescott who "with a benignant smile and a genial voice answered the students' queries both the wise and the unwise." What Dr. Vaughan thus writes was equally true of his own painstaking efforts, greatly appreciated by students. There was naturally nothing which savored of intimacy between himself and them but a cordiality existed in their relationship. My own acquaintance with him, of course quite casual at the time, ripened eventually into enduring friendship and is treasured as a choice possession.

I never suspected until encountering the story in *A Doctor's Memories* that his early education had been all 'round of such a liberal character. That he was gifted as a teacher all having acquaintance with his methods can testify, and it is plain that familiarity with the classics lent much to the well-chosen diction present in both his verbal and written productions.

It was the theory of President Terrill, the "greatest educator (he) ever knew," of Mount Pleasant College, where Dr. Vaughan became the "Alpha and Omega of the advanced class in Latin," that no one "knows anything until he can state it in writing."

To Dean West of Princeton, Dr. Vaughan said: "Although my adult life has been given to sciences, I wish to testify that the first author to stimulate the pyramidal cells of my cerebral cortex was old Virgil and even now in my

old age, there is only one book which I prefer to Virgil and that is Dryden's translation, which I read with less effort." Of Professor Frieze he writes that to be with him "was to receive lessons in grace and courtesy. He was my ideal of a learned man. I could not make of him a Trojan hero; not even an Aeneas; he was a Virgil himself."

Concerning his old home in Missouri, "colored by the imagination of Walter Scott, the stately lines of Virgil and the eloquence and wisdom of the great pagan, Cicero," he is no less than poetic. Of the vicissitudes of childhood when during the Civil War brother was arrayed against brother, and where he learned to love peace so dearly that a willingness to fight for it developed, he writes thrillingly but without bitterness.

"Whatever I may *intend* to say," he declares, "when I am to make a speech, when I actually begin to talk, I always give expression to my convictions." "God pity the country," he exclaimed, "in mental frenzy," at a mass meeting where there was considered a call to arms for the Spanish-American War—"whose tramps must fight its battles." This speech Dr. Vaughan humorously writes, brought about a commission from Governor Pingree. "Some enlist because they like the soldier's life, some for patriotic reasons, but I received my commission because I talked too much."

No manner of doubt exists in the minds of those who knew him well that he spoke from conviction. His language was plain and forceful. At a meeting of the State Medical Society in 1883, he said, "I have attended several meetings . . . but never before have I known the Committee on Admissions to wait so long before reporting. There is an apparent intention at least to choke off those who have come here to join this Society." During a symposium in the same Society in 1894 he inquired [I can hear his voice] "whether there were any bacilli in those guinea pigs, anywhere in those guinea pigs, when they died of tuberculosis." The one interrogated could not reply "off hand." He (Vaughan) thought the logic employed in the discussion was bad . . . that "the only possibility of controlling the spread of consumption consists in the destruction of the bacillus."

Those who have been perplexed and irritated by the frequent neologisms purveyed in medical nomenclature are entitled to a chuckle over his pronouncement, "the coining of new words is sometimes mistaken for progress in science." His "Memories" are shot through with practical humanistic philosophy.

From early years at the University the Vaughan home was an open house for students. During forty-five years of teaching no graduate of the Medical School "escaped" an invitation there. His disciplinary measures toward the careless and intemperate consisted at first in a warning which betrayed acquaintance, chapter and verse, with the student's shortcomings. He was accustomed in classes to emphasize the danger to others through impure contacts. His "as an individual you are of no importance anyhow, risk getting venereal disease if you must" was apt to be efficacious with the lustful.

His rise was rapid. In 1887 he became dean of the medical faculty. Among his choice "Memories" are appreciations of his sometime colleagues.

Dr. Ford "knew anatomy, both human and comparative. He lived and taught it in a way that held the individual attention of every student—he awakened a love for it in his hearers."

Alonza B. Palmer was "a great teacher of internal medicine."

George E. Frothingham "was my preceptor and I cannot speak of him without love and reverence."

Maclean was a most fascinating man. "I do not think that any teacher in the University within my times was so greatly admired by the students as he."

Of Dr. Charles B. de Nancrede he writes, "I cannot overestimate the services rendered by this man to the University."

Of Dr. Darling, Dr. de Nancrede's successor, he "honored his chief and himself in a splendid way."

And of a venerable friend, "I left the cottage bearing in the memory chamber of my brain a portrait of a saint such as no old master ever painted."

When he resigned from the University, a newspaper reporter asked for a list of his discoveries. He was told that there were many important ones and was given the names of Doctors Novy, Huber, Warthin, Edmunds, Weeler and others!

Among my pleasantest memories are those of a visit to us in Flint with his charming wife and three sons, all later to be distinguished in medicine. The family was on the way to Northern Michigan where apart from the carks and cares of teaching, of court duties and medical practice, he was accustomed to spend the summer months. Another choice recollection is of a reception at Oak Grove to Dr. Sawyer, president of the State Medical Society. Witty, versatile in story telling, he was at his best on this occasion and those who were privileged to remain late will not forget his contribution to the entertainment of the company, one of whom in sheer hysterical glee slipped from a chair to the floor.

Neither can I forget an afternoon's drive, to which he invited me, about Washington. Its history, its topography, its monuments were completely familiar to him. This was during the late war. What a fine soldier he was! How much the country is in his debt for meritorious service during this and the earlier embroilment of 1898.

His thrilling experiences under fire in the battle of Santiago, his contention with the yellow fever to which disease he himself eventually succumbed, the beneficent and far-reaching results in conservation of soldier life, attained by the Typhoid Fever Commission in which he had membership, his record in the World War, his contributions to bacteriology, chemistry, general medicine, and sanitary science need not be detailed. Discussion of these would be supererogatory as well as necessarily fragmentary. Verily, just as the caption of a biographic sketch in the Detroit *Saturday Night*—"Dr. Vaughan, a Medical Pioneer."

He regretted the expansion of once fascinating cities like Detroit and Cleveland which he would now "drive miles to avoid penetrating."

He "never read a lecture and seldom used notes," preferring to study the faces before him.

In *A Doctor's Memories* (1926) he avers: "My life has been determined by heredity and environment. These are the factors that have molded my being, given direction to its development, marked out the course of its growth and set bounds to its activities. Had either been different from what it was, better or worse, I would have been different from what I have been and from what I am."

In the same year I wrote as follows: "If one had his life to live over, it would be an exact replica of the past—his reactions to his environment would be identical. If environment or reaction differed in any particular it would not be 'his life.'"

My last communication from him was dated at Washington, April 27, 1927, and reads:

"My Dear Old Friend:

"I have just read your letter and your aphorisms. The former I greatly appreciate, and the latter I endorse in toto. Although I am now in hospital, I am hoping sometime in the near future to meet you in the flesh, when we will go over our common experiences.

"With love,

"Yours truly,

"Victor C. Vaughan."

—*C. B. Burr,*
Flint, Mich.

DR. VAUGHAN AND POPULAR MEDICINE

DR. VICTOR C. VAUGHAN is remembered for his great services to medicine and the medical profession, with the same warmth of appreciation that surrounds the names of Pasteur, Koch, and other pioneers who were his contemporaries. In his years of endeavor at the University of Michigan; his work in combating the germ enemies within the gates of our armies in America's last two wars; in his inspiration of hundreds of medical research workers; in his important part in the peace mobilization of science that followed the World War, he made contributions to civilization that would have brought fame to a dozen men less intellectually tall than he.

One major benefit he conferred upon the world, his own profession may not yet appreciate, so quietly and unostentatiously did he do his work. Dr. Vaughan was a pioneer among the advocates of the popularization of medicine. And like the best of advocates, he practiced his theories.

I have heard it said that when teaching his classes at Ann Arbor he found that if he used simple language instead of the more technical medical dialect, that may be heard in medical meetings even today, his students were better pleased and better instructed. In some cases the technical language of science is a convenient and necessary code for the concise expression of exact meanings, but in other cases it is a dialect that serves the same purposes as the secret language of Indian medicine men. Dr. Vaughan never hesitated to use plain English when it was most useful; he never failed to use the proper technical terms when they were necessary. His great works on epidemiology are delightful reading in spite of the fact that they are standard medical compilations.

From this insistence upon clarity in medical literature, it was a logical step to the phase of Dr. Vaughan's work that I knew best. The late Dr. Edwin E. Slosson and I were engaged in the beginnings of Science Service, an institution which has as its object (and I am glad to say our activities have borne fruit) the presentation of science to laymen in such a way that even those without technical training may understand. In our efforts to so express the facts of scientific research in vivid newspaper English that our stories would successfully compete with accounts of murders, baseball and politics, we were fortunate in having the encouragement and aid of Dr. Vaughan. He was chairman of the division of medical sciences of the National Research Council under whose roof we had our offices. We interrupted him when he was in the midst of writing portions of the volumes of his epidemiology, we listened to stories of his experiences in fighting disease, and I hope that others felt, as we certainly did, that our stories were the better for it. In the face of silent skepticism as to the possibility of telling the man in the street about science, Dr. Vaughan replenished our enthusiasms. More formally, he served as a trustee of Science Service.

I like to think that there was some slight reciprocal reaction that resulted from our drafts upon his knowledge and time. We discussed with him his ambition, soon to be splendidly fulfilled, to establish under the American Medical Association a reputable popular journal of medicine and health to carry medical and health information direct to the public. There were at that time financially successful so-called "health" magazines that were doing much to spread medical misinformation.

Dr. Vaughan's success in converting the American medical profession to the radical procedure of publishing a lay journal of medicine is too well known to be told here. *Hygeia* is a monument to him.

So let there be added to other fond memories of Dr. Vaughan the fact that he was a pioneer in the popularization of science and an opponent of the idea that medicine is an art of which the public must be kept ignorant.

—*Watson Davis,*
Washington, D. C.

AN APPRECIATION

"A prince once said of a king struck down
'Taller he seems in death!'
And the word holds good, for now, as then,
It is after death that we measure men."

I MAY memorialize but could not measure a friend. There is no rule to gauge the appraisals of friendship, to measure its boundaries or fix its limits.

I waive any attempt to evaluate Dr. Vaughan's contributions to scientific medicine. No one could though others may list them. Their influence in life-saving is beyond estimate or conjecture. The direction of the first step, in any venture, is more important than its length. The pioneer in scientific research must start from that known, which is so little, plant upon it that which he has discovered and protect their relation, before he may safely approach the unknown. What seemed to us as intuition in Vaughan was conclusions reached from exact knowledge. New vistas opened before him as he blazed trails thousands have since followed, each erecting a marker, perchance a monument to scientific medicine, that the less patient or little skilled might read as they traveled in search of health for the sick or to protect the well against disease.

The University of Michigan Medical School, for thirty years its Dean, is his imperishable monument. Yet its students remember it largely because of its Dean.

To have seen Dr. Vaughan in his own home, presided over by a perfect American wife and mother, surrounded by five sons, mind meeting mind on the same plane of common interest, no restraint, no disrespect, all interested in that presented by either; the father with the boy's heart, the man's intellect, the scientist's knowledge; the guest feeling that he belonged there—that was the test of a man, matured in every essential attribute. Example was his family monitor. Precept was left to those who have nothing else to offer.

Life looks upon death as a tragedy. The universal, human passion to preserve this life, with that hunger for life after death, has created the many religions of mankind, all praying for future existence. Even the agnostic's grave-side eulogy whispers the hope of immortality. But he knew that the life of the little and of the great, alike, is rounded by sleep and, that man's future has been provided for. First the life to be lived, then the sorrow of those left, which he dreaded but could not protect against. Once he said, "I can truly say that with old age, so far as I have experienced it, I am content. It is true that I am apprehensive—not of what may happen to me after death, but of what may happen before that event, or may happen to my loved ones before or after my departure. In other words, only the things of this world concern me greatly." Of the death of his soldier son, in France, he wrote, ". . . . but we know that his fate awaits all, and that ultimately we shall join him either in eternal sleep or in whatever form of

conscious existence the wise Creator of the universe has provided for mortals, when their earthly duties are ended." In these lines is a measure of the man.

My first relations with Professor Vaughan were those of pupil and teacher. Leaving the university I rarely saw him; not at all for many years, but he was always, to me, a presence. When in 1913 I asked if he would like to become President of the American Medical Association his characteristic reply was: "Unsought, I would be highly honored. Sought, I would feel disgraced." He filled that position of distinction with unqualified credit to himself and to his profession.

The idol of his own household, the ideal of his pupils, the scientist, the unwavering friend—what more should be required of a man? To us "Taller he seems in death."

—*Hubert Work,*
Colorado Springs.

THE VICTOR C. VAUGHAN SOCIETY

ANN ARBOR, MICHIGAN

THE Victor C. Vaughan Society is the crystallization of an idea to form an organization of those medical students interested not only in diagnosis and therapy, but also in the history of the art; a field somewhat beside if not beyond the purely academic study of medicine. As happens in the organization of many societies, after being formed for diverse purposes, they perpetuate the names and ideals of men by taking the names of these men unto themselves. A group of senior medical students, having organized this society with a definite purpose and function, looked about for a name.

One cannot be associated with the Medical School of the University of Michigan for four years without being impressed with the singular significance of the name "Victor C. Vaughan." His personality pervades the traditions of the school, making him revered by teacher and student alike. His deeds parallel the growth of this medical school and medical science itself during his régime. The nation knows the accomplishments that made him famous and has benefited thereby. It remains however for a few of us to appreciate the personality that did more for this medical school than all the accomplishments that were his. This organization then pays homage to Victor C. Vaughan the man, and itself feels honored to bear such a name. In adopting it the society no doubt did more honor to itself than to Dr. Vaughan. Thus also did the society take a long step in assuring its continuance.

Dr. Vaughan never knew that this society carries his name as the letter at once asking his permission and informing him of the adoption of the name "Victor Vaughan Society" was in the mails at the time of his death.

The society as organized in the fall of 1929 consisted of twenty senior medical students and our faculty advisor Dr. Samuel Altshuler. During the year, twenty of the most interesting men in medical history were discussed—each member having chosen to study and present the story of one man. Each paper presented was discussed by a faculty member who in many cases had been personally acquainted with the character presented.

The faculty responded splendidly and by their voluntary interest have been of untold help to us. Many opened their homes to us to hold meetings there; several faculty members made it possible for us to have lantern slides and photographs made and available for the meetings. All faculty members invited to participate in the discussions responded with an enthusiasm which was indeed stimulating to the organization in its infancy.

The names of the medical savants discussed and those reading the papers are as follows:

Vesalius, by Vaughan V. Morrissey.
Thomas Brown, by Wm. Bromme.
Sydenham, by Richard Freyberg.
Laennec, by Samuel Diack.
Roentgen, by Wm. Coventry.
McKenzie, by Spencer Braden.
Pasteur, by Charles Lemen.
Lister, by Park S. Bradshaw.
Hunter, by Sherwood Russell.
Virchow, by Horace Boyden.
Rush, by Robert Curry and Dr. Adams.
Bright, by Elwood Mason.
Beaumont, by Chas. Hudson.
Semmelweis, by Justin Neighbor.
Oliver Wendell Holmes, by Philip Roche.
Walter Reed, by Frank Maxwell.
Harvey, by Harry Leavitt.
Ehrlich, by John Cameron.
Ricord, by Frederick Lendrum.
Osler, by Donald LeDuc.

The above papers are at the present time being prepared for publication in the *Michigan State Medical Journal*.

The organization has recently elected twenty junior medical students who will carry on the work next year with Dr. Thomas Findley as their faculty advisor. Thus do we hope to help perpetuate the name and ideals of Dr. Victor C. Vaughan.

—*Robert Curry*,
Ann Arbor.

"A DOCTOR'S MEMORIES"*

Negro Slavery in Missouri as I Saw It

NEGRO slavery was well established in Missouri long before it became a part of the United States. However, the number of negroes in that territory in proportion to the whites was never large. In 1860 the population of Randolph County, in which I lived, consisted of 8,777 whites and 2,619 negro slaves. In the whole of Missouri at that time the proportion of whites to negroes was as nine to one. The number of negroes decreased from the Missouri River to the Iowa border and in the uppermost tier of counties there were but few.

It is not my purpose to enter into any detailed description of the history of slavery in Missouri nor of the various legislative acts concerning the civil rights of the negro and his legal protection from cruelties that might be inflicted upon him by his master or others. I am telling only of what I saw of this institution on my father's farm and among our neighbors. The negroes in our community were divided into two quite distinct types. One had a black-yellow or tan skin. He was quick and alert in his movements; generally spare, muscular and graceful; above the average height of the other type; intelligent and ready in comprehension; generally good-natured and eager to join in every sport; though impulsive and quick to get angry. The males of this class were the artisans on the farm, carpenters, blacksmiths, tanners, harness makers, teamsters, etc. The females of the tan type were cooks, waitresses, house girls, spinners, weavers and dressmakers. The tan type of negro as I knew him was not due to admixture of race. He was not a mulatto. I am quite sure that the two types were distinct in their African homes, and, among us at least, they did not readily marry and intermarry. The tan type of negro, as I knew him, resembled the modern Zulu more than he did his comrades of the other type.

Those of the second type were coal black with thick lips and flattened noses; slow and somewhat awkward in movement; inclined to corpulency; highly superstitious and emotional in their religious conceptions; some of the males were great exhorters and some of the elder females great shouters in their religious revivals; inclined to great devotion to the whites and capable of making sacrifices for those whom they loved; most of them had great pride in the family which they served and resented the undertaking of any apparently menial service on the part of the whites; most of them were thoroughly trustworthy; slow but dependable and for the most part fairly industrious; greatly appreciative of words or acts of commendation; credulous and easily deceived; thoughtless and care free; willing to trust tomorrow and its needs to master; contented

*Editor's Note: Dr. Vaughan deleted the following three chapters from *A Doctor's Memories* in order to reduce its size.

While as they now appear, they lack sequence, we have incorporated them in the Memorial Number for the benefit of those who have read and enjoyed his autobiography and have expressed the hope that some time a second volume would be written.

to enjoy today and its blessings; improvisors of meaningless melody; with a soul full of music often struggling for expression; energetic but unskilled performers on the banjo or the violin.

Louis, the most efficient of the tan negroes on our farm, made, with the help of his fellows and under father's direction, a family carriage, including all the iron and woodwork and the greater part of the harness. This vehicle would not have graced Connecticut Avenue, though I have seen and occasionally still see more disreputable turnouts on that fashionable thoroughfare. The same artist made modest articles of furniture for the house and the cradles in which the babies were rocked and the coffins in which all ages and both colors were consigned to mother earth. Louis became quite a skillful carpenter and possibly he might without undue exaggeration have been called a fair cabinet maker. These and other encomiums I might pass upon Louis, who, I will admit, was one of my childhood heroes. However, his last act in my presence was one of the tragedies of that long ago time. Notwithstanding all the talk about freeing the negroes and their enlistment in the army, no negro on my father's farm showed any intention of leaving until the spring of 1864. One morning before breakfast I stood at the wood pile near the kitchen gate. Father and two or three negro men were near me. Louis, with an ax on his shoulder, was trying to drive a troop of young horses into the barnyard. One colt, in a spirit of playfulness, turned and scampered by him. Louis viciously threw the ax at the animal. Father cried out: "Louis, what do you mean?" The negro picked up the ax and facing father said: "You touch me and I will give you the ax," or words to that effect. Father made no reply but quietly turned and walked into the house. Shortly he was back with his rifle. Drawing a bead on the negro he ordered him to drop the ax. The man stood stricken with terror and slowly the ax fell from his hands. Father then told the other negro men to bind Louis to a post and to strip him to the waist. One of the big black negroes laid on the strap with gusto. The next morning Louis was gone and later we learned that he had enlisted in a negro regiment.

Within a few months after the above-mentioned incident, every negro on the farm and most of those in the community acceptable to the military service had enlisted in the army. In the winter of 1864-1865 when my father was hunted by the militia, as I have told elsewhere, the negroes aided in his hiding and on at least one occasion saved his life. Neither the military accouterments of the searchers, their cajolery and promise of reward nor their threats could induce the negroes, young or old, to reveal the whereabouts of their master.

When the family fled to Illinois in February, 1865, the house, the farm, and all that the marauders had left, including some live stock, were left in charge of Uncle Jeff, who aided us in our departure and had as definite an idea of our intended destination as we could give him; but to all inquirers, especially from those in military dress, our disappearance was to him as unknown and inexplainable as if we had been taken to heaven in a chariot or swallowed into the earth. During the summer of 1865 Uncle Jeff, with such help as the negro women and children could render him, cultivated a few acres and reaped a meager harvest. On our return in the fall of that year everything was intact and turned over to Mars John in perfect fidelity. Uncle

Jeff and his dependents remained as tenants on the farm until death removed the elder ones and time dispersed the younger. Every third load of the harvest went to the negroes, while personal service and work in keeping up the place were paid for either in money or in produce. Surely no steward could have been more faithful to his trust than this old negro man. His care had saved the buildings and their contents from the despoliation and torch of the marauders who, during the late months of 1864 and the early part of 1865, rode over the fairest portions of my native state.

When the family in the fall of 1865 found itself again on the old Missouri farm, Mars John, with all other former slave owners in Missouri, found that his economic condition had been greatly enhanced by the emancipation of the slaves. In former times he had been compelled to house, clothe, and feed his negroes, through infancy, childhood, youth, manhood, and old age, in health and sickness, through nonproductive as well as productive seasons, whether the price of tobacco and hemp was low or high. Under the old régime if a negro, through ignorance, inadvertence, or viciousness did injury to a neighbor's property the owner was responsible. In slave days if a negro girl went astray, her mistress was, at least, criticized, probably ostracized by her former friends. The mistress of a house was expected to bring up her negroes in good behavior much as she did her own children. For a while the Missouri slave owner dreamed that he was being robbed, but on awakening and after rubbing his eyes and looking about he found that some one had lifted a heavy burden from his shoulders. Many of the slaveholders, certainly of those in Missouri, did not believe in the institution of slavery, but they did not know what could be done with their negroes should they liberate them. Now, the government had done this thing and had shouldered the responsibility. Possibly some of the then wise old heads, like Thomas Benton and others, had seen what should have been evident to all, that negro slavery in Missouri did not pay—that economically it was all wrong. Possibly some of them were mere sentimentalists as they were accused at the time of being. Sixty years have passed since the legislature in the state of Missouri freed its negroes, but the free negro problem has not been wholly and satisfactorily solved yet. The New England abolitionists of sixty years ago charged the slave owner with debauchery in concubinage of his more likely female slaves. Since emancipation the number of mulattoes has increased so rapidly that it is safe to predict that within a few centuries black negroes in the United States will be as rare as white elephants are now in Africa. Miscegenation, practiced but rarely by the slave owner, promises to be the ultimate solution of the negro problem. This is not a prediction for the future but a statement of a present fact. As to its effects upon both races I have decided opinions, but this is not the place in which to state them.

In the harvest of 1866, I, in my fifteenth year, driving a Wood mower, was cutting more hay in a day than seven lusty negro men with their scythes would have cut in seven days. Besides, driving a mower was a good thing for the boy. Had slavery continued, he would most probably have been doing something else, neither so pleasing nor so useful. Watching the heads of red clover fall did not always interrupt the boy's thoughts on what Caesar had to say in indirect discourse, nor, *mirabile dictu*, prevent his following the wanderings

of Aeneas as described by Virgil. One day, however, thoughts along these lines were abruptly and painfully interrupted as the flying shuttle cut through a hidden bumblebee's nest. The hitherto docile and lazy horses were instantly converted into their wild ancestors scampering over Russian steppes with their heels striking out madly for the four corners of the earth. The chariot driver, with equal celerity, threw out the gear and managed to check his flying steeds before they had reached the farther end of the eighty acre field, while his discourse became most positively direct. With this experience the boy learned a lesson not found in the writings of either Caesar or Virgil, but notwithstanding this he has not always been equally successful in the promptitude with which he throws his blades out of gear. In adult life the memory of the bumble bee incident has been awakened, when in anger I have not been able to throw my hot words out of gear soon enough to save me from humiliation if not from mutilation.

Negro dialect was discouraged among both whites and blacks in our community. I do not intend to say that our speech would, in all particulars at least, meet with the approval of grammarians. In fact, I am quite sure that had Missouri in or about 1850 been split off from the rest of the world and so continued up to the present time there would have developed among its people a distinct dialect. Dialect specialists assert that there is such a brogue, or at least there was a generation ago, and that it was recognizable over the greater part of the territory west of the Mississippi since Missourians were the most numerous pioneers in this region. After I went to Michigan one of my close friends was Professor Hempl (late of Stanford University), an earnest and learned student of dialects in this country. With his dialect map of the United States he was wont to come to my laboratory where I was busy with microscope and test tube and ask me all kinds of foolish questions. He found it easy to place me in one of his larger groups which includes parts of Kentucky, Tennessee and Missouri, because when asked to call "cows" I said "sukey" and not "co-bos." I carried water in a bucket and not in a pail. I designated a frequently used implement in cookery as a skillet and not as a spider. I bought butter by the firkin and not by the jar or tub. I wore galluses and not suspenders. Hempl said that the only Missourianism I employed was an affirmative grunt something like "uhum."

Among my grandmother Dameron's negroes was a couple who in my boyhood days were very old. To the children they were "Daddy" and "Mammy." To the other members of the family they were Uncle Harry and Aunt Esther. "Daddy" was no Beau Brummell. His face, the small part of it which one could see, was coal black. His features were mostly hidden by his abundant woolly hair and whiskers as snowy white as the fleece of the whitest sheep and I must add that they were never stained by tobacco. His underlip turned down and quite constantly the saliva drooled from his mouth keeping him busy wiping it away which he did with the back of his hand and his shirt sleeve. The backs of his hands were as black as pitch and his fingers were long and loose-jointed with no signs of arthritis. He had no tasks, at least during the time I knew him, but was far from indolent. One generally saw him with an ax on his shoulder or cutting weeds and bushes in the fence corners with a

brush hook. He had frequent visits and conversations with the devil whom he regarded as by no means as evil as his Satanic majesty is held in our estimation. His devil rode in a small coach drawn by tiny black horses, sometimes by black dogs. Occasionally he rode some black animal, horse, dog or cat. His Satanic majesty gave Uncle Harry exclusive and certain information concerning both past and coming events. He was especially strong and reliable in foretelling the future, generally pertaining to the weather or to the crops in different fields. In short, Uncle Harry was a senile dement with harmless hallucinations and delusions. To the children he was most gentle and kind. He believed that he had been brought from Africa, but of course this could not be true. Grandmother said that he had been in the family beyond her memory, but in her childhood he had been an efficient man. Aunt Esther was younger and less infirm. She did not believe in Uncle Harry's devil but she was full of stories of "raw heads and bloody bones," which she poured into my ears as I sat on her lap before the great kitchen fire in the winter or before her door in the summer. For a while Aunt Esther's stories so frightened me that after listening to them I was afraid on a dark night to walk alone the few paces from her cabin to the back door of the house, but, being assured by mother that they were mere stories, I teased for them as a child does for fairy tales. However, I did once see Aunt Esther's "raw head and bloody bones." I had grown old enough to help do the chores. One evening while it was still light, accompanied by two negro boys, I was sent to the woodland pasture to find and drive in some horses. We lingered under the mulberry tree until it was growing quite dark. Then, with some anxiety, we began our search for the horses. They had strayed farther than usual and when found they were not inclined to follow our directions. In this part of the pasture there was a neglected graveyard, unfenced. I was heated and angry. While running after the horses my foot struck a grave stone and I fell sprawling full length on the mound. As my foot struck the stone I was uttering a swear word and before I could rise I saw the apparition which Aunt Esther had so often and so graphically pictured. I told mother about it and she said that my vision was pictured by my conscience and was due to the swear word.

Most of our negroes were deeply religious. While the whites were divided into many sects the church of preference for the negroes was the Baptist, though many affiliated with the churches of their own white folks. There were in our community at that time no separate negro churches. Negro preachers were numerous and exclusive services were occasionally permitted in the churches for the whites. Negro revivals were most frequently conducted in some grove with one or more whites present to see that the exercises were kept within bounds. For the most part, however, negroes attended church with the whites, a railing or a gallery setting apart the seats reserved for them. Basket dinners were common in warm weather. The whole family, white and black, with hampers of food, in farm wagons, drove to the church. After the morning service a picnic dinner came with visiting, gossiping, crop discussions, and more or less love-making among the young people of both colors. Then there came a second sermon, a christening, a baptism, or some other function. After emancipation quite a discussion arose as to the propriety of the whites at-

tending services with the negroes. The congregation was divided and some un-Christian things were said. In the midst of this feeling it was decided to awaken a revival. An elderly preacher, with some local reputation in bringing sinners to repentance, was chosen to give the first sermon. He had spoken vehemently, if not eloquently, for an hour or more when he began a peroration, something as follows: "Brothers and sisters, saints and sinners, old and young: The good old ship Zion lies at the wharf. Who will go aboard? Her sails are filling with propitious winds. Who will go aboard? She is bound for the heavenly shore. Who will go aboard?" After multiplying these descriptions and these questions the good man stood disappointed at his failure to secure response. At this juncture a huge black mammy on a back seat arose and started down the hall. The preacher was dismayed. On the front seats he saw those who had vowed that they would not worship with freed negroes. He hesitated and then his Christian spirit prevailing he stretched forth his hands advancing to the penitent and cried out: "Come on, mammy, come on! I will take you on board if it sinks the old ship."

The health of the negro slave was looked after as well as the knowledge of the time permitted. In the fifties a strong, vigorous negro man in Missouri was worth, or at least sold for, $1,000 to $1,500; sick, he was worth nothing. For selfish, if for no other reason, the owner did not imperil the health of his property. Even marks left by whipping diminished the negroes' value, not so much on account of the physical injury but as an evidence of the vicious character of the bearer. The same doctor administered to whites and blacks and charged the same fee for each call. There were in our community at that time no chiropractors, no osteopaths or other cults. All practitioners of medicine were graduates mostly either of Philadelphia or Louisville schools. From a hygienic standpoint there was undoubtedly overcrowding in the cabins, but most of these were built of logs and with a huge fireplace filled with burning wood there was no need of artificial ventilation. The food was the same as the whites had with the exception of certain delicacies like squabs. There was plenty of it and vitamins were not wanting in the diets of those days. I once heard mother chide Louis for leaving so much on his plate. "Lord, Miss Adeline, how does I know that I get enough unless there is something left?" The clothing, possibly with the exception of Sunday suits, was all made from fibers grown on the farm and there carried through every step in their manufacture. Whites and blacks wore in summer coarse linen and in winter rough jeans.

The two diseases, tubercuIous and syphilis, now so prevalent among the negroes were rare among Missouri slaves. In some communities tetanus of the newly born was common. This was due to lack of asepsis in dressing the cord. This fact was ascertained by the country doctor in the South long before the discoveries of Pasteur and Lister. In the preface to my work on *Epidemiology and Public Health* I have said something about the sanitary conditions of the Missouri farm in my boyhood days. As we now see it, it was pitiful. The average life was short and the death rate was high, but this was common throughout the country and it applied to both races alike.

Slaves were amenable, the same as whites, to all the criminal laws, but there were three offences for which special penalties for the negroes were provided. These were (1) conspiracy and insurrection—death; (2) criminal assault on a white woman—castration; (3) resistance to owner or overseer—39 stripes on the bare back.

Christmas on the old Missouri farm was a great time for the white children and for the blacks of all ages. There was one ceremony carried out on father's farm which was of supreme interest. I do not know how widely this was practiced. The last time I saw it was during the Christmas of 1863. Some months before this holiday the negroes selected a great tree. Of course, its selection must have the approval of the master, but I never knew of any difference on this point. There were on the farm fine walnuts and oaks, but these were reserved for lumber. There were great shagbark hickories, some four or more feet in diameter, but the best part of these trunks were, on account of their toughness and elasticity, reserved for ax helves and wagon spokes, tongues, double and swingletrees, while the less desirable portions of the tree were split into fence rails, but the negroes were not selecting a tree for its value in the market. They were searching for a log which would absorb much water and which would burn slowly. Each year there was much discussion as to what species of tree on the farm would prove most satisfactory for the desired purpose. Uncle Harry consulted his friend the devil about it and then gave a most decided opinion. Others held that Satan was not an authority on slow and low burning. He had hot fires, even those that would melt iron and other metals. Besides, the devil used brimstone as an auxiliary fuel and this the negroes could not do. The problem became quite important from an educational standpoint. I, as the eldest white child, read everything in the modest library, seeking information on the capacity of different woods in absorbing water and their lasting properties in combustion. I found nothing; even Virgil in the Georgics, where he deals out his great store of agricultural wisdom in his stately lines, had nothing to say on the points under consideration. The question of the size of the log was much discussed. All agreed that size was not everything and that some big logs would burn out quicker than smaller ones of different wood. It is too bad that I made no written record of the arguments, and I admit that I was so wanting in scientific acumen that I have no protocol of the actual experiments. The tree having been decided upon was felled with axes and a section of the trunk, measured to fit in the enclosure intended to receive it, was cut out with a cross-cut saw, all agreeing that a log with smooth ends would contain more wood and absorb more water than one with chopped ends. The log thus prepared was dragged by oxen to the big pond in the woodland pasture, rolled in, and there permitted to rest in the mud and water until Christmas eve when it was rescued and brought to the kitchen door. After an early and unusually hurried breakfast on Christmas morning all the family, white and black, assembled in the dining room. All the wood, embers, and ashes in the great fireplace were drawn and the Christmas backlog rolled into place. Smaller sticks made up the front of the pile and the fire was lighted. By the time the fire was crackling and the flames were shooting up the chimney, mother stood at the table with an immense bowl of egg-

nog in front of her. Each member of the family, first the whites and then the blacks, in order of age, received from her a glass of this delicious beverage and drank to her health. Christmas was then supposed to be inaugurated and the holidays were to continue for one week and as much longer as a trace of the backlog could be identified. If my memory does not betray me, the gain was usually from one to three days. Of course, everyone will understand that a vacation on the farm cannot be absolute. Fires must be kept going, food must be cooked and served, and stock must be watered and fed, but all nonessential work ceased during the holidays.

There was no Christmas tree but much giving of Christmas gifts. In this there was a certain etiquette. The one who cried out the name of some other member of the family and then added "Christmas gift" was entitled to something. Yet between whites and blacks of the same ages it was never proper for the white to call out first. White children might claim gifts from adult negroes and I may add always had them, especially from "Daddy" and "Mammy," but with this exception it was always the proper thing not to see the servant on Christmas morning until he cried out "Christmas gift" and then one should seem much surprised. The children of the house had great fun watching the servants on Christmas morning pretending to hide behind the leafless shrubs in the yard in order to catch a Christmas gift from the master of the house, who was always stone blind on that morning; and the look of pretended surprise on his face when he raised his eyes in recognition of the greeting was a joy to all. "Oh, Mars John, I caught you that time," was the gleeful cry that came from the mock hiding place. Then the master's eye would fall, after acknowledging that he had been taken wholly unawares to be equally surprised at the next call. The mistress went through a like ceremony with the house servants; and when all had assembled in the dining room before the briskly burning fire with the great water-soaked backlog, the gifts so recently claimed, but long prepared in anticipation, were piled on the table ready for distribution accompanied by kindly words in recognition of services faithfully and cheerfully rendered. The scene certainly was in strong contrast to the overdrawn pictures of *Uncle Tom's Cabin*, exceptional in reality in Missouri.

One of the pleasing mysteries of the farm was the location of the private watermelon patches. In addition to the large patch for the whites, each adult servant had his private patch and the location of this was supposed to be known only to the individual owner. The watermelon seeds were always planted on the first of May before breakfast, and after the large patch had been seeded, each adult servant took himself and his well-selected seed to the corner of the farm where he had already prepared the ground. All through the summer and fall the locations of the patches of Uncle Dick, Uncle Jeff, etc., were supposed to be known only to their respective owners, although there was not a nook of the farm unvisited by the barefooted sons of the farmers and their daily companions of color. Melons always grew to the largest size and had the reddest, sweetest hearts in Uncle Dick's patch, and it was with much pride that he occasionally brought from that unknown spot one of its largest products as a gift to the family. The barefooted son of the house had often looked with covetous eyes on the great green-striped melons that grew only under the

magic care of Uncle Dick's hoe, and once the temptation proved more than mortal boy could bear; but, after the interview with his father the next day, he learned that although stolen fruits may be sweet to the palate they are prone to sour in the stomach.

Once or oftener each summer there was a barbecue, usually in the latter part of August, after the corn had been laid by and the tobacco hoed, primed, topped, and succored. Pits were dug, filled with logs and brush and great fires roared. Pigs, sheep, and oxen were dressed and suspended over the glowing coals. Much of the preparation and the cooking were done during the day and night preceding the assembly. Often the barbecue was the occasion for some political event. Candidates from governor down to constable were present, and in a large arbor much eloquence was poured out upon both attentive and deaf ears. The negroes were there en masse, some as cooks and waitresses and some as hucksters. Many of the latter had booths arrayed and arranged most diversely. On the rude shelves were great green watermelons, yellow cantaloupes, cakes and lemonade, all for sale. Little white boys vied with one another in pointing out the superiority of the displays made by their family negroes. I was a hawker for "Uncle Dick," and I never failed to receive my commission. In the afternoon when my allowance for the day had been exhausted and I came at the head of a small troop of white boys loudly proclaiming the superiority of Uncle Dick's wares, he, or more likely Aunt Mary, his wife, would call to me: "Victor, here's a big melon what has just busted itself. You boys go and eat it."

While on such occasions I frequently saw a drunken white man, I never saw a negro in this condition. Possibly fear of punishment restrained the latter, but so far as my observation went, drunkenness was not a common vice among the Missouri negro slaves. A wider observation in later life leads me to conclude that next to the red man the white man is the most ready victim to alcohol. Furthermore, I believe the more freely the blood of white and black have mingled, the more generally has the latter developed the vices of the former. Be this as it may, I never, during slave days, saw a drunken negro on my father's farm, although there was always in the house, and not under lock and key, a jug or a demijohn of whiskey. While on this subject I may add that one of the earliest of my recollections was being sent to the garden every morning in summer for the mint for my grandmother's mint julep, and as a reward I was permitted to eat the excess of sugar in the bottom of the glass. According to certain teachings, I should have grown up to be a drunkard. While I never was in pre-Volstead days a total abstainer, alcohol has never been a temptation or a danger to me.

We had one negro, George, who stuttered painfully and swore volubly. I have always thought that it is no sin for a stuttering man to swear. Certainly it does loosen his tongue. I have an idea that even my mother looked upon George's profanity as an infirmity rather than as a sin. One morning I learned that George had "got religion" the night before at a revival then in progress. As we hoed tobacco side by side, I said: "George, I suppose you will swear no more." He leaned on his hoe handle, his lips twitched, his whole facial structure went through violent contortions. He made a desperate effort, but

he could not begin without a "damn." And George went through life with many "damns." I hope that the recording angel did not keep tally. In George's speech an oath was what the starter is to a gasoline engine.

The white children were taught to be respectful to the blacks. If I failed to thank the waitress who passed the hot biscuits, I was not allowed another at that meal. I acquired so deeply the habit of thanking the waiter that I still do so in hotels and restaurants and I have often been embarrassed by finding myself quite audibly thanking the waiter at a private dinner. The small white boys were also taught to tip their hats to the elderly negroes. Parson Root, of whom I speak elsewhere, was once criticized for tipping his hat to an old negro. "What," said the parson, "should I show myself less of a gentleman than the old negro?" On my visits to Missouri in recent years I have never seen a white boy tip his hat to an aged negro. So far as I remember, the only time my father ever laid his hand on me in anger was when I changed a request of his into a command. Preparing to shave, he told me to ask a negro girl to bring him hot water. I went to the door and shouted: "Lucinda, father wants hot water for shaving, step quick." My command had hardly reached its recipient when a heavy hand fell upon my shoulder and sent a painful impression through every part of my anatomy as father asked, "Who told you, sir, to say step quick?" I sinned no more, at least not in that direction, in the presence of my father.

In the fall we frequently indulged in hunting coons and opossums down in the creek bottom. We frequently found the opossums hanging by their tails from pawpaw bushes. The coon was captured with more difficulty, and it was quite an event in life to bring home one of these ring-tailed animals. Proud indeed was the boy who could wear a coonskin cap with a tail hanging down behind. This honor was supposedly reserved for those who had actually participated in the capture of the animal. Indeed, in our neighborhood for a boy to appear at school under a coonskin cap was a distinction. It was a badge of honor, a medal of bravery, and an announcement to the world that the wearer was worthy of the honors of manhood. From my eighth until my twelfth year I frequently accompanied the negroes on their coon hunts. There was no need of starting early, since it was supposed that the wily coon did not leave his hiding place until the shades of night were well drawn. With a half dozen or more hounds we would go into the great forest. Soon the dogs were busy and, when one of them let out a cry, negroes and small boys followed as rapidly as brush and swamp permitted. On successful nights, which were rare, the dogs treed the coon. Generally, the animal was wise enough to select a large tree. Under this a great fire was built and occasionally it happened that Mr. Raccoon grinned down upon us from some inaccessible branch. I never knew a negro to show evidence of laziness in a coon hunt. However great the tree and however dense its wood there were always volunteers to ply the ax. The critical moment came when the tree fell. The dogs were immediately among its branches and the hunted animal either escaped or made fight. Choosing the latter alternative always met with disaster. Dogs and negroes were too much for the coon once within their reach. One coon a night was sufficient to satisfy the most ambitious hunter. When success

crowned our efforts we had a great war dance about the fire. The negroes sang weird chants and dirges. Some of these still run through my memory chambers, but I would not dare to try to reproduce them. On many a coon hunt I was the only white among a dozen or more negroes. Some may say that my parents were neglectful of my training and that I had opportunity to enlarge my vocabulary of vulgarity. I can truthfully say that I never heard a negro slave tell a dirty story. My morals were in no particular corrupted by my associates. Many a time while hunting coons some negro man has carried me on his back over rough or swampy places when I had grown too tired to keep up with the desired pace.

I am sorry to say that the negroes, in my neighborhood at least, did not continue their reputation for industry and integrity after freedom came to them. On my second summer vacation at Michigan I went back to the old farm. On the morning after my arrival I wandered to a distant wheat field where four negro men were supposed to be busy cradling the grain. I found them playing craps in the shade near a small stream. I stripped myself of my outer clothing and told them I would shock the bundles as fast as they cut and tied the stalks. These negroes did at least one day of full work, but the next morning I did not get up. The doctor pronounced it a case of typhoid fever, but I have always thought that it would have been more correctly diagnosed as fatigue fever. At least it continued for some two weeks and I did not repeat the foolish experiment.

Russia in 1897

THE International Medical Congress met in Moscow in 1897, and I had the pleasure of being a delegate and taking a part in the proceedings. In this chapter I will not discuss the learned papers and epoch-making discoveries presented but will tell of the incidental observations and experiences some of which subsequent events have brought into prominence. Our family decided to make the trip an occasion for the extension of our knowledge of the big world and those who dwelled within the regions to be visited. Early in June, Mrs. Vaughan, the three older boys and I, with our bicycles, landed at Antwerp. A few days later, about mid-afternoon, we rode into Brussels in a heavy rain, with our scant belongings attached to our handlebars. We had our membership cards in the Touring Club of France and our guidebook directed us to the Hotel Bordeaux. We found this hostelry uninviting and the proprietor seeing our predicament showed us undesirable apartments for which he demanded unreasonable prices.

I had been in Brussels before and knew something of the city; so I said that we would go to the Hotel de l'Univers. This provoked the mirth of the boniface who predicted that in our dress we would not get farther than the door. This decided the matter and within a few minutes we were telling our story and making our appeal for shelter to the dignified, beribboned porter of the more inviting hotel. Soon we were drying our garments before a big fire in a spacious, handsomely furnished room. When

the dinner hour approached, the porter came, asking if we desired our meals served in our rooms or would we go to table d'hote in the large dining room. Asked about the fitness of our raiment, he told us that an Ecumenical Council of the English church was in progress in the city; that some of the chief dignitaries were residing in the hotel; that these might regard us inquiringly; but that other guests would look upon us as a distinguished bishop, possibly an archbishop and his family; so to the dining room we went. We gave some days to seeing the capital of Belgium during which time our gastronomical needs were supplied at the bountifully laden table d'hote. Some months later, Mrs. Vaughan, one of the boys and I, properly clothed, drove to the Hotel de l'Univers. As the dignified porter greeted us he asked: "Where are the other boys?"

Leisurely and pleasantly we rode through Waterloo, spending a day on the battlefield, Mons, Mauberge, Guise, Le Fer, St. Quentin, Soissons, Compiegne to Paris. It was cherry time and we made the purchase of these and the drinking of light beverages excuses to stop, linger in the homes of the peasants and try out our French. Previous visits had made us acquainted with Paris, its beauties in architecture and city decorations, its treasures in art, literature, and science and its wickedness, but this was our introduction to the rural and village population of France. These were joyous days spent in touring this portion of la belle France. Little did we dream that the clouds of war were to anchor here for more than four years and pour down their missiles of destruction on this part of the earth; that its productive fields, then rich with harvests of fruit and grain, would be plowed by shells of dynamite; that its small cities and villages, then overflowing with hospitality and comfort to us as wayfarers, would be sacked and burned by savage Huns; that even the air, which we then breathed so joyously, would be filled with poisonous gases; that the fair prospect, upon which we then looked, would be converted into an inferno, surpassing in its terror and cruelty the descriptions of hell by Dante; that our sons would be called to aid in arresting the ruthless progress of the invader; that our firstborn, then the leader, the life and the joy of our party, would today be sleeping in the soil of France.

Some are now inclined to chide France for her continued resentment toward Germany. It is easy to forget injuries done another, but he who has felt the heel of the barbarian on his neck long bears the scar.

Before leaving Ann Arbor, I had received from the secretary of the Moscow Congress a letter asking me for the names of our party and of the points where we intended to enter and leave Russia and suggesting that I call upon my Paris banker for further information. On doing this I found passports into Russia relieving us from all customs inspections and granting free transportation for all members of the party over Russian railroads.

A few weeks later, the small hotel at Vevey where we were stopping was thrown into excitement by the arrival of a gentleman from Russia with his family, numbering fourteen. The next morning as we sat in the spacious garden, looking out over Lake Geneva, the Russian gentleman joined us, saying that we were Americans and he wanted to know us. He was Mr. Alexander Barry; born and reared in St. Petersburg; graduated at the Polytechnic School

at Zurich in 1872; went to America; worked for two years as a day laborer in the car shops of Jackson and Wiley at Detroit; met with an accident resulting in a broken leg; was under the care of Dr. Herman Kiefer; returned to Russia; had shops in seven cities, employing in each from 2,000 to 3,000 men; resided in Moscow; was returning to that city in a few days; would secure hotel accommodations for us and would meet us at the station on our arrival.

We traveled via Munich, Vienna, Cracow and Warsaw, lingering for a few days at each of these places. We had left our two older sons at Vevey, and were joined at Munich by Dr. Alice Brown and at Warsaw by Dr. Novy, his wife and two sons, so we made up a party of eight.

I had promised Mr. Barry to telegraph him on leaving Warsaw. The hour of the train's departure was uncertain, as was then the case with all Russian trains, so I did not telegraph until the train had started. I was informed that the telegram could be sent only in Russian. After some search through the train I found a Warsaw doctor who kindly made the translation and relieved me from further care in that matter. We left Warsaw about 10 A.M. and reached Moscow about 5 P.M. the next day. The train was a special of first-class cars with sleeping accommodations and filled with delegates, among whom we found many friends, American, English, French, and German. At Minsk and Smolensk we were greeted by reception committees and were provided with abundant refreshments. We found Mr. Barry in his rubber tired carriage drawn by Orloff horses at the Moscow station and soon were in comfortable rooms at the Hotel Shveivsariia. We had asked Mr. Barry to secure rooms for us in a distinctively Russian hotel; we did not wish to be in a cosmopolitan hostelry. We were the only foreigners in this house and none of its staff spoke any foreign language.

Having deposited us with our luggage at the hotel, Mr. Barry drove away, saying that he would call in half an hour and take us to dinner. We drove to Petrovsk Park and dined at the famous Hermitage Restaurant. It was a distinctive Russian dinner, everything, except tea and coffee, being native products. We selected our fish as it swam in the pool. The wines including a fair champagne were made from grapes grown in Russian soil. Mr. Barry's hospitality was unbounded. His family being in Switzerland, he called his sister from her summer home, opened his house, and insisted on our being at home.

The day after our arrival proved to be the holiest of the many holy days that then bedecked the Russian calendar and Mr. Barry came early and took us through the Kremlin. As a guide he was so efficient that soon, as many as could keep within hearing distance joined our party, and I was surprised at many of the statements he made. Standing by the great bell he said: "We Russians say: we have the greatest bell in the world, but it was never rung; the greatest gun but it was never fired; the greatest Czar but he never rules; the present Czar is an untried boy and we must wait some years before we can place an estimate upon him." I was greatly surprised at the freedom with which not only Mr. Barry but his friends, to whom he introduced us, spoke of their government, its institutions and their management. Should I today in Washington speak as critically of President Coolidge and his administration

as the Russians in 1897 did of their Czar and his ministers, I should expect to see the cold shoulder of many of my friends turned toward me, if I met with no greater evidence of disapproval.

At a dinner I quoted a French author who said: "Russia is an absolute democracy in an absolute monarchy." "Yes," spoke up Mr. Barry. "That is the exact truth and if there is anything worse than an absolute monarchy it is an absolute democracy." Then, he proceeded to tell how franchises were secured from "mirs" by bribing the elders, how titles were bought and sold, how the church impoverished the people by feeding them upon superstition and exacting tithes, how the governors of the provinces bartered privileges, etc., etc. I received the impression from these educated Russians whom I met, the number of course being small, that they were not blind to the many and obvious defects of their government. I could not discern that they had any religion. The uneducated, and I was told that illiteracy then included more than 70 per cent of the population of the empire, regarded their government as a politico-religious burden placed upon them by heaven and were at heart bitterly antagonistic to their priests, who, so far as I could ascertain, were for the most part an ignorant, idle, pestiferous lot. I am not at all surprised at the antichurch attitude taken by the Soviet Government.

From the Kremlin Mr. Barry took us to a Metropolitan service at the Church of Our Saviour, a splendid marble temple, built by the Russians as a thanksgiving to God for their deliverance from Napoleon. The great cathedral was packed with thousands of standing natives interspersed here and there with small groups of foreigners. The service was in old Russian which nobody, with the possible exception of the Metropolitan, understood. There was a choir of 400 male voices without any instrumental accompaniment. Such church music I have never heard elsewhere. The sound waves began in the distance, approached nearer and nearer and swept through and over the great throng in overwhelming harmony. At one time I found myself quite isolated from my party and wedged into a group of ragged, dirty pilgrims. Their faces were ecstatic with religious fervor. One tried to prostrate himself and bring his forehead to the floor, but the crowd was too dense. I saw another with every visible evidence of extreme poverty hunt through his rags and draw out a copper which he bestowed upon a companion apparently even more pinched by want than himself.

One of the happenings at the Congress has gotten into current literature in distorted form. The city of Moscow voted a prize of 10,000 francs to the living man who had done the most for medicine and asked the Congress to name the recipient. The Congress did the only thing it could do; it appointed a committee to select the man. The chairman was the great German pathologist, Rudolf Virchow, and fortunately I was one of the members. Here was a chance for a reenactment of the story of the apple of discord. The committee was in a quandary and greatly regretted the duty imposed upon it. For obvious reasons the recipient could not be a man from one of the great nations. There were two or three meetings. The wise chairman, who was a politician as well as a scientist, said "We will prayerfully consider this matter, meet Sunday morning and decide it." We met in the gorgeous hall of the nobles; the chair-

man, tactfully speaking in French, proposed the name of Henri Dunant, the founder of the Red Cross, giving as his qualifications his personal poverty and his nationality, a Swiss. After Dunant's death I read in several European and American publications the statement that the poverty of his later years had been relieved by a pension granted him by the Empress of Russia. At the next meeting of the Congress the Moscow pension, which was to be continuous, was awarded to a Spaniard. I do not know what has become of it since. Alas! International Medical Congresses are, temporarily at least, moribund, and Moscow has probably had other uses for its money. These International Congresses of Medicine and other sciences seemed for a while to promise peace between nations, since science saw a multitude of ways in which the race might spend its energies more profitably than in war. Had the Kaiser had the vision and intellect of Virchow the great catastrophe might have been averted.

We had great fun with the droshky drivers. There were no fixed tariffs and the rule was that one must bargain with the driver before entering the cab or pay whatever he charged on alighting. We would wander to distant parts and then stop at some corner and call "Hotel Shveivsariia." Soon there would be about us a host of drivers and the bargaining would begin in pantomime. They would indicate by the sweep of the arms a great distance and by the fingers the number of rubles, generally beginning with ten. The price would have been more had the men possessed more fingers. We would make our offer by extending fingers, generally beginning with one. The play was invariably interrupted by some native addressing us in German, French, or English: "Brother, you are a stranger, where do you want to go? How much does the driver want? Get into this cab; the charge will be so and so."

One evening I beat a driver down to a ridiculous sum. He was to take us to Petrovsk Park, wait until we dined, and drive us back to the hotel. On our return I handed him three times the amount agreed upon. He began to make the change; I made him understand that he was to keep the whole. Dull as he was he was not slow in comprehending me on this point. He dropped the reins, threw his arms about me, and, drawing me to his breast, kissed me on both cheeks. I never tipped another droshky driver.

The Polish Jew in Cracow on receiving a gratuity lifted the donor's coat tail with ceremony and kissed the hem of the garment.

The Grand Duke Sergius, afterward assassinated, received the delegates and there were many banquets and musical entertainments. We heard much good music in Russia, then the breeding place for great musicians. We heard Chaliapin for the first time and since his coming to this country we have never lost an opportunity. In my seventy-fifth year I would walk a mile tonight and pay the fee from my scanty purse to hear him repeat *The Two Grenadiers;* then every nerve in my anatomy thrills from its roots in brain or cord to the minutest ramifications. In my opinion, the Russians in both music and literature are the most natural and realistic people in all the world.

We spent some hours in a convict camp where about three thousand had been assembled preparatory to transportation to Siberia. There were no political prisoners among these. When a community (mir) decided through

its board of elders that a member was unfit to continue in it, he was not sent to prison or hung, but his name was stricken from the roll, he was declared legally dead, and was sent to Siberia. If the condemned man had a wife she could accompany him or remain as a widow. I cannot think that cruelty is a Russian characteristic. He may permit suffering through his ignorance, indifference or fatalistic attitude of mind, but the practice of any barbarity I believe to be foreign to his nature. Possibly a wider acquaintance might change this opinion.

Nothing could better illustrate the utter incapacity of the Russians in practical matters than the way they failed to provide for the transportation of their guests at the International Congress of 1897. Even the Soviet Government has made great improvement in this particular. Their hospitality was prodigal in an extreme degree, but it was unorganized and resulted in much confusion and discomfort. Each delegate and each member of his party carried a pass from the point of entering to that of leaving the country. The special trains consisted of compartment cars, each compartment providing for four passengers, and convertible into a most comfortable bedroom at night, but there were no reservations and one had to risk limb and life in securing a place. We experienced some discomfort on our ride from Warsaw to Moscow, but later we saw an unbelievable tumult. Some hundreds of delegates were to go one night from Moscow to St. Petersburg, we among the number. For two days before notices in many languages were distributed and posted, saying that at 7 P.M. the regular train carrying no delegates would leave; at 7:30 and again at 8 o'clock special trains for delegates only would go. Each delegate was asked to have his pass stamped before entering a train. Mr. Barry, promising us that we would see something we had never seen before, took us to the station before 7 o'clock, seated us in a gallery where we could look down into the spacious waiting room, told us to keep out of the crowd, not to worry, and assured us that we would ride to St. Petersburg that night in comfort. There we sat, comfortably smoking, drinking tea, and eating cakes. An old man, who might have sat for a portrait of Moses, or some other Hebrew patriarch, stood at a small table in the waiting room, with his official stamp in his hand. Delegates, in droves of fifty or more, shouting and gesticulating in all the languages of the civilized world, filled the waiting room, crowded about the old man, knocked over his table, and disregarding the stamp, filled successively each of the three scheduled trains. Two or three policemen did appear but they were treated with the same rude courtesy bestowed upon Moses. When the last train pulled out an announcement was made that there would be no more trains for St. Petersburg that night, and the lights were turned down. Mr. Barry put us into his waiting carriage, told the coachman to drive about the parks and to return by 11 o'clock. There was a beautiful moon and we enjoyed the ride and tried to recall scenes from Tolstoy, Turgenef, and Dostoievsky. On our return we found the waiting room lighted and occupied by a moderate number of quiet people among whom we did not see a delegate's badge. Each of us had a comfortable bed and passed over the 400 miles of smooth road in dreamless sleep.

When the door of our compartment opened in St. Petersburg the next morning, we were greeted by a handsome man in the full dress uniform of a colonel. This was the foreman of Mr. Barry's St. Petersburg shops, who had secured rooms for us on Nevski Prospect, and under whose guidance we saw the city built by Peter the Great and its environs. The institution which most interested us was that for experimental medicine, situated on a beautiful wooded island, encircled by the branching Neva and occupied by the most eminent of Russian scientists who with every available facility were devoting their lives to research. Medical men know of the great achievements secured by their labors. Here Dr. Novy and I met Fraulein Schultze, who had been a fellow student with us in Koch's laboratory in 1888.

Before we left Moscow Mr. Barry told us that he would be in St. Petersburg on a certain day, would again assume the rôle of host and guide and had in mind a wonderful treat for us. By that time we had come to believe that all things, in Russia at least, were possible to Mr. Barry. When he told us this, he wore the countenance of a small boy who had secured a present and could scarcely withhold the desire to inform the recipient of its great value. Several times he repeated: "Be up early and have your breakfast before I come." We knew from the daily papers that President Faure of France was then visiting the Czar, but we never suspected that this event had any connection with Mr. Barry's treat. He did come early and impatiently tore us away from a half-finished breakfast. In droshkys we were whirled down Nevski Prospect, across the bridge ornamented with the wonderful horses, and soon were at the quay; were rushed into a waiting boat and quickly carried to Cronstadt. Here we were transferred to a larger boat and on looking about saw three French men-of-war. Suddenly the band on the French flagship began the melodious and plaintive strains of the Russian national anthem and the Czar's yacht bearing its imperial owner and the French president came out from Peterhof and anchored alongside the flagship. Some hours were devoted to the parting formalities. Many decorations were bestowed, toasts were drunk and lunches served. While we looked on, we were introduced to Mr. Barry's friends on our boat and had opportunity to finish our breakfast. Among the many interesting men we met the most charming and communicative was the colonel of the Cossack Regiment constituting the Czar's bodyguard. This man had evidently learned his English by reading an English translation of the Bible. He talked in biblical terms and the burden of his communications was the injustice with which other European nations had treated Russia. As I remember, his discourse ran as follows: "In 1877 we buckled on the armor of Christianity and went down and smote the Turk hip and thigh; then Bismarck and Disraeli robbed us of all we had won. Had it not been for these men there would now be no Armenian atrocities; there would be no Turkey in Europe; but I shall live to see the day when the Russian service will be heard in St. Sofia; the Triple Alliance is against Russia; now France is with us; France and Russia can withstand the Triple Alliance; but the question is what will England do?" I hope that this man lived long enough to see his question about England answered as it was in 1914, but that he died before the Russian debacle came in 1918.

Some time after noon the French fleet took its departure, the Russian ship leading the way, the French flagship with President Faure on the bridge following, escorted on each side by a Russian ship on one of which we were. The French bands played the National Anthem and the Russian band took up the Marseillaise, while cannons boomed from the shore. In the midst of this excitement I found that my son had drawn from his capacious pockets a small American flag and was waving it most lustily. I cautioned him but the Cossack colonel, lifting him on his shoulders, told him to wave it. So far as I know, this was the only American flag displayed in the Gulf of Finland that day. In 1912 I was telling Professor Vladmiroff of the day in 1897, when he said: "You heard the Marseillaise the first time it was officially played in Russia since Napoleon's invasion."

Late that evening we returned to St. Petersburg tired out with the exertions and excitements of the day, wholly unconscious of the fact that we had witnessed a great historical event and with no vision of the world disturbance with which it was to be connected.

We returned to Paris via Helsingsfors, Abo, Stockholm, Lubeck, Hamburg, and Berlin but met with no unusual experiences. Our Russian journey widened our knowledge of the world and of the people living therein, enabled us to follow more intelligently the catastrophic events that followed and stored our memories with reflections upon which we are dwelling in our old age. We kept in occasional touch with Mr. Barry until the war; since, we have been unable to ascertain anything about him. We would welcome an opportunity to return some of the many kindnesses he bestowed upon us.

The Michigan State Board of Health

I SERVED on the Michigan State Board of Health from 1883 to 1919 with an interval of two years. In the State I have always been known as a Democrat, although as I have elsewhere indicated, my politics, both State and national, has fluctuated from time to time. Any one acquainted with the political complexion of Michigan will understand that my appointment on this Board must have been largely in the hands of Republican governors. I have heard those interested in public health work urged to steer clear of party affiliation. I can say that the leading Republicans in Michigan have, for the most part, been above petty politics in all matters pertaining to the health and welfare of the people. My first appointment on this Board was made by a Democrat, Governor Begole. Much good-natured chaff was thrown at this man on the ground that he was not educated. Be this as it may, he was not devoid of either wisdom or wit. In addressing the American Public Health Association at an annual meeting in Detroit, he spoke of physicians coming together for the purpose of limiting the spread of disease and said: "If I should be called upon to address a gathering of lawyers assembled for the purpose of preventing litigation, I would say with Simeon of old, 'Lord, let thy servant depart in peace for mine eyes hath seen thy salvation.' "

At the expiration of my first term, the Republican candidate for Governor, Mr. Luce, was a warm personal friend and coworker in health matters. I went to the polls intending to vote for him, but on my appearance at the booth a group of Republicans shouted out that I must vote the Republican ticket or they would see that I would not be reappointed. Angered by their threat, I picked up a straight Democratic ticket, the only unscratched ticket I ever voted, and deposited it in the box. At the expiration of my term Governor Luce reappointed me and with my commission handed me a protest signed by a number of Republicans in my own ward saying: "Take this and have some fun out of it. I would have reappointed you if every Republican in the county had signed it." I did have some fun out of it.

One Republican, Governor Bliss, did ask me if I voted for Bryan or McKinley. I told him that I had voted for McKinley. He took up his pen to sign my commission but I held his hand and said: "Governor, there is one more question you should ask me. Did I vote for you? I did not." Laughingly he said: "I did not ask you that question," and signed the paper. Repeatedly I went before the legislature asking appropriations for the State Board of Health and the university and I never felt the least embarrassment on account of the political party to which I was accredited. Michigan Republicans, at least those with whom I had to deal, regarded a man's political affiliation as a personal right. Possibly their magnanimity might be accounted for by the fact that during most of this time, Democrats in Michigan have been so few that they have been negligible.

The Michigan State Board of Health was fortunate in having for its secretary and executive officer for so many years, Dr. Henry B. Baker. I have never known a man more thoroughly devoted to his work than he. To him the health of the people of the state was meat, drink and raiment. In it he forgot self and every other interest. Moreover, his devotion was not blind, nor actuated by sentiment, but intelligently directed. Dr. Baker deserves high rank among that small group of American pioneers in preventive medicine who set in motion the machinery by which human life has been greatly prolonged and human suffering greatly reduced. The present generation is enjoying the fruits of their labors and should not forget those to whom they owe these blessings.

When the Board was organized by act of the legislature of 1871, kerosene lamps were generally used in the illumination of houses, and frequent explosions destroyed in the twinkling of an eye, as it were, both property and lives. Doctors Baker and Kedzie went to work at this problem in a practical and scientific way. They discovered methods of determining the burning and flash points of kerosene and thus enabled the state to exclude from the market dangerous illuminating oils. Then they took up the matter of the resuscitation of the drowned and devised a method which is still superior to all others. For many years this was known as the "Michigan method." Recently it has been rediscovered by Professor Schafer of Edinburgh and is known under his name. The two methods are practically identical, even in detail.

Dr. Baker made an early contribution to the world-old problem of the effect of weather upon disease. He showed that in Michigan at least the

death rate from pneumonia goes up as the mercury in the thermometer goes down. This does not mean that this rate is invariably higher in cold than in warm regions, but it does mean that in a given place the pneumonia death rate increases as the temperature falls. Of course, temperature is only one of the factors in the cause and spread of pneumonia. In the early '80's some one suggested that salted food might be a factor in the causation of pneumonia. Dr. Baker decided to put this theory to a test and asked my assistance. Inasmuch as these experiments have never been published, I will give a brief summary. We secured six fine monkeys. These were kept for some weeks in an air-tight compartment, all the air entering being passed through sterilized cotton. The temperature of the air in the cage was kept constantly at about 80° F. The food consisted solely of milk and fruit without addition of salt. Suddenly the animals were transferred to a similar box in which the temperature stood below 10° F., kept there for from two to six hours and returned to the warm box. Not one showed any ill effects. Then they were kept for three weeks in the warm compartment and fed upon milk and fruit heavily salted. Exposure in the cold air was repeated and again without any evidence of pneumonia. Apparently, increase in the salt in the food did not predispose to pneumonia. I should add that these animals did slowly develop arthritis, but the salt in the food probably played no part in this.

The Michigan State Board of Health has been from the first an advisory and not a legislative or mandatory organization. It has sought to educate the people in sanitary matters and not to enforce its teachings by legal enactments, leaving the latter to the initiative of the people as they advanced in knowledge. The value of isolation and disinfection in the infectious diseases was shown by comparative statistics in communities where these measures were and were not practiced.

Early in its existence the Board asked the legislature for an annual appropriation for the holding of sanitary conventions in different parts of the state. These were held for many years and did much to enlighten the people. The intelligent members of each community in which these conventions were held attended. The audiences were generally small but they made up in quality for what they lacked in numbers. The doctor who did not attend was likely to be faced by embarrassing questions from his patients who did. Lawyers and preachers took an interest in the matter, spread the gospel and prodded their village and city authorities into action. This was many years before the university provided extension lectures. The time was much more propitious for this form of instruction than the present. The automobile, the graphophone, the movie, and the radio were still unknown and even so serious a matter as a talk on public health was a welcome diversion. Besides, now, even public health talks are being overdone and every crank is airing his views and advertising his wares under this title. In my opinion, the Federal Government, the states, universities and certain benefactions are squandering thousands of dollars annually in so-called public health courses, child welfare and health demonstrations. When the Michigan legislature of 1915 appropriated $100,000 for the State Board of Health to use as it saw fit in the combat against tuberculosis wise men from the east hurried to the

west to tell us how to spend this money. They were ready to supply us with so many speakers at so much a day to tell the people of Michigan that it had been demonstrated that tuberculosis is a contagious and therefore a preventable disease; that Koch had isolated the causative agent; and that disinfection of the sputum of tuberculous patients should be practiced. The Board thanked these wise men for their altruistic interest in the matter, but informed them that every intelligent man, woman and child in Michigan was already aware of these facts and that the Board would start a traveling clinic through the state to find out about the prevalence of the disease and help the physicians in its recognition and prevention. Because a procedure was wise and beneficial in the '80's is no proof that it is suitable at the present time.

As I have indicated the Michigan Board, founding its teachings on the unimpeachable work of Villemin in the sixties, began preaching the contagiousness of tuberculosis years before Koch discovered the bacillus. In doing this, quite naturally came an enumeration of the measures necessary for the restriction of the disease. This accounts for the marked fall in the death rate from this disease in the state in the past forty years; so marked has this been that one enthusiastic statistician has been led to predict that the region of the Great Lakes may be the first part of the nation from which tuberculosis will disappear. What we now need above all things for the protection and betterment of the health of the people is the establishment of a health center in every county, consisting of a hospital with a diagnostic laboratory, and the whole under the management of a staff of experts skilled both in preventive and curative medicine. Such a health center should provide an ample library with standard books of reference and current scientific journals. Every progressive city already has such facilities more or less developed but all in progress of growth. When similar conditions are provided for rural communities there will be less need of the cry "Back to the farm." The lure of country life will call to many and not in vain. The ideal land is that in which each citizen owns his own home and dominates his own affairs, so far as the rights of others are not abridged.

In his desire to educate the people in health matters, Dr. Baker (1895) framed a bill providing for instruction in all public schools in the nature of each infectious disease and the avenues through which it may be transmitted. The publications in which this instruction is provided are supplied to the teachers by the Board. Of course, generations must pass before the full effects of this provision can be reached, but it means progress. However, all progress is liable to many jolts and not infrequently there is retrogression. I do not dream that the people of Michigan or any other state are nearing the sanitary millennium, and I am fully aware of the fact that there is a limit below which the death rate from disease is not likely to fall. Then, there will always be new methods and devices for killing off the population. The automobile is now more deadly than smallpox and in the number of murders we are equalled only by our sister republics of the south with a fair chance of our winning the cup.

In the '80's cases of poisoning from cheese, ice cream and other milk products became so numerous not only in Michigan but in adjacent states

that a search for the cause was amply justified. The Board instituted this investigation and the bulk of the work fell upon me and my laboratory helpers. In its prosecution I had the aid of the cheese makers, especially that of Mr. Horton, of Lenawee County, who put his factory at my disposal. An inspection of the dairies supplying this factory with milk furnished the clue. In many of these the cows were plastered with dung and other forms of filth. The animals were not submitted to even a pretense of cleaning. From unclean udders with filthy fingers the milk was drawn into unclean receptacles. There was no thought of keeping the milk cool. It stood for hours in the barn and the cans were carted often in the hottest season and during the hottest hours of the day to the factory. Here these cultures, containing the bacterial flora of the neighborhood were poured into a common vat in which bacterial growth continued under optimum conditions. Small wonder that cheese and ice cream made from these cultures should prove poisonous. Rules were drawn up for dairy inspection, for cleaning the animals, for attention to the hands of the milkers, for sterile receptacles, for cooling the milk before and during transportation, etc. Poisoning from cheese, ice cream and other milk products became rare and soon ceased so completely that some say the whole thing is a fairy story and never occurred.

The Board, backed by the Michigan Business Men's Association, memorialized the Board of Regents of the University to ask the legislature of 1887 to make an appropriation of $40,000 for the building and equipment of a hygienic laboratory at the university. The purposes for this request were stated in the following order: (1) research into the causation of disease; (2) the examination of suspected waters and foods on the request of health officials; (3) instruction of students in bacteriology. The Regents of the university reluctantly complied with this request from the Board of Health and put this item in their request for appropriations. The bill passed the legislature, was vetoed by the Governor and then passed over the veto. Thus was established the first hygienic laboratory in this country and the second in the world—the one at Munich, under the direction of Professor Pettenkoffer, being the first. I wish to make the plain statement that this laboratory owed its existence to the State Board of Health and not to the Regents of the University. This appropriation was expended in the erection and equipment of a building in the rear of the library, the basement and first floor were devoted to physics while the second floor and the attic were allowed for the purpose for which the appropriation was designed by the legislature. This building was known to collegiate students as the physical laboratory and to the medical students as the hygienic laboratory. When the new medical building was occupied in 1903 the hygienic laboratory and its work were transferred to it. I was made director of the hygienic laboratory and began to carry out the purposes as mentioned in the memorial of the Board of Health. In this work I had the most valuable assistance of Dr. Novy who has since become director of the laboratory. Samples of suspected water and food came in great numbers. During the following ten years reports including descriptions of the bacteria, both harmless and harmful, found in 700 suspected waters, were made. It was in one of these reports that I coined the

word "toxicogenic" (poison-producing) for those organisms which elaborate poisons. When I first used this word in a paper before the Association of American Physicians in Washington some of my friends and critics assailed me. But I knew that etymologically it is correct because it had the sanction of Professor Kelsey and the word has found its way into standard dictionaries as have other words suggested under like conditions thus showing that the use of our language is not in the exclusive keeping of those who reside east of the Alleghenies. These samples came from a wide range of territory; as far west as Arizona; as far south as Mississippi; and from Canada. At that time bacteriologic laboratories were few and far between. Now, even small cities enjoy these facilities. In making these examinations we employed what we designated as: "The Michigan Method." This like my new words did not receive the sanction of my eastern friends and I admit that it has been supplanted by better methods, but at the time it served my purpose in discriminating between safe, doubtful and dangerously polluted waters. It was the means successfully employed in detecting, checking and eradicating typhoid epidemics in both small and large communities. That those whom I served had confidence in my findings is shown by the following incident, which has both a humorous and a tragic aspect. A superintendent of a private water company in a small town in the Northern Peninsula sent a sample of the water supply. I telegraphed him that the sample was dangerously polluted. He said nothing about this report. The people continued the use of the water. Two weeks later after many cases of typhoid had developed the health officer of the locality sent a sample. I telegraphed him the facts. The people went after the superintendent with a rope and the last definite information was to the effect that the pursuit was still on in the woods of northern Michigan. This incident had an awakening effect upon private water companies as to their responsibilities. Beginning in 1888 frequent examinations of the drinking water supply of Ann Arbor were made, and the citizens and the students kept informed. On May 4, 1894, it was found that the water contained a toxicogenic bacillus, resembling the typhoid organism in cultural reactions but not identical with our laboratory strain. A bulletin was issued advising the use of only boiled water and the superintendent of the water company, then a private company, was notified. This superintendent was a physician of intelligence, a brother practitioner of mine. He came to my laboratory in wrath and made disparaging remarks about me and my method. I advised him to personally visit each of the sources of his supply. He soon returned with an apology. Five cases of typhoid fever resulted from this contamination.

In 1895, Dr. McClymonds and I examined 65 samples of cheese from as many factories located in Michigan, Wisconsin, Illinois, New York and Ontario. During the eighties and early nineties one or more bacteriologists and chemists were kept busy at the hygienic laboratory of the university examining cheese and other milk products. During the nineties the number of samples sent in rapidly decreased and in the past twenty years only one sample of poisonous cheese has found its way to this laboratory.

During the eighties and early nineties a bacteriologic laboratory was regarded by the uninitiated with more respect and fear than a menagerie of wild beasts. At Hagenbeck's show one is protected from the lions and tigers by their cages and the iron railings but what protection can there be from invisible germs that are supposed to be floating through the air, seeking entrance to one's body through the mouth, nose, eyes, ears and even through the unbroken skin and ready to feed upon one's tissues bringing disease and death? I had many annoyances and occasional fun out of this phobia.

In 1888 I crossed the ocean from Bremen to New York on the Lahn with a wire basket full of a choice collection of pathogenic bacteria. Indeed, I had everything complete for the opening of the new laboratory in the fall. Koch's laboratory and the Pasteur Institute had denied Dr. Novy and me nothing. My stateroom chum was a university colleague, Professor Denison of the engineering department. He had examined my sealed tubes and had convinced himself that no harm could come unless the tubes should be broken. He occupied the lower and I the upper berth. We anchored the basket to the sofa and deemed ourselves quite secure. One night in a storm he called to me that the twine holding the basket had broken, that the tubes were being tossed from one side of the room to the other and that we would be infected with Asiatic cholera before morning. I was seasick; he was not. I replied that Asiatic cholera would be a relief to me and that I would not crawl down to save myself from any or all infections. He, brave fellow that he was, secured the basket with straps taken from his valise and I was saved not only my prize collection but from paying useless tribute to Neptune.

In 1891, Mrs. Vaughan and I landed at Liverpool with the same basket. The inspector of customs paid but little attention to our trunks and valises and stamped his approval; but the basket was too much for him. The more I labored to explain the more suspicious did he become. He hinted rather plainly that we looked like Fenians—whatever these beasts might be—on our way to London with the intention of dynamiting Westminster and the houses of Parliament; or, horrors, our destination might be Windsor and our intention to expedite the translation to Elysium of that good old German woman who then ruled the empire. The inspector sought the counsel of his superior and he, his, in turn, until we had the whole customs force about us while we saw ourselves interned in the Tower of London and finally expiating our guilt after the manner employed by Henry VIII in getting rid of his numerous wives. Finally, one man, more widely versed in current literature than the others, solved the riddle by saying: "Oh, I know; them are them Koch things." The basket was stamped and we were soon complacently dining in a good English hotel.

Much of the reluctance exhibited by the authorities in accepting the appropriation for the laboratory was due to their fear of the germs. Of course, their solicitude was not for themselves but for the students under their guardianship. This was openly expressed a few years later when I proposed that an effort be made to secure the location at Ann Arbor of the State Sanatorium for Tuberculosis, provided for by the legislature. When in the fall of 1888 Dr. Novy and I had stored away our dangerous germs,

imported from Europe, and were giving to the medical students the first comprehensive course in bacteriology offered in the United States, our laboratory became the *fons et origo* of all kinds of spooky stories, some quite surpassing in their hair-raising potency those told me of "raw-head and bloody bones" by black mammy in the old Missouri home. Even the dissecting room lost its pre-eminence in this particular. Mothers frightened their rebellious offspring into seemingly good behavior by threats of exposure to the hungry germs in the laboratory. Older children in crossing the campus gave our building a wide berth. Students in other departments shunned us. Learned professors looked at us with suspicion. The professor of physics whose laboratory was beneath us complained of the handicap under which he labored. One day an expressman in bringing a large carboy of suspected drinking water up to us, stumbled on the first floor, and delivered his burden short of its proper destination. Shrieks of terror from below brought me to the stairway where I saw the heels of fleeing professors, assistants and students. To add to the joy I shouted: "Every drop contains a million typhoid bacilli." There was no return until my janitor had mopped up the water and scrubbed the floor with bichlorid. Some days later I was summoned to appear before the august Board of Regents. I faced nine grave-looking men and was solemnly asked if I was not endangering the lives of collegiate students working in the physical laboratory beneath mine. In my reply I tried to be humorous—a fault I seldom display. I said: "Your question implies a great compliment. Dr. Novy and I and our students work in the midst of bacteria and you express no solicitude for our health and lives. There must be a divinity that throws a protective mantle about the person of a young man when he graduates in the college and enters the medical school."

So far as I know there were only two cases of accidental infection in the laboratory. I was inoculating guinea pigs with a typhoid culture while my assistant, Dr. Wheeler, held the animals. A drop fell from the syringe on her hand. Both of us saw it and she promised to sterilize her hands when we were through. We proceeded with our task and both forgot the drop until ten days later when she developed a mild attack of the disease. Of course the bacilli did not penetrate the skin but found their way into her mouth. There have been many accidental infections with this bacillus in other laboratories and none, so far as I know, have proved fatal.

The other instance was more serious. A young doctor, not a student, and supposedly already well grounded in laboratory technic, wanted to work with the plague bacillus. Our culture of this organism was old, attenuated and quite nonvirulent but would serve his purpose; so it was given him and he was assigned to a room in which he could prosecute his investigations which were to be continued indefinitely. During this time the Surgeon-General of the United States Public Health Service sent Doctors Novy, Flexner and Barker to San Francisco to study the plague. On his return Dr. Novy brought fresh, virulent cultures of this bacillus. The young doctor purloined one of these and through faulty technic became infected. Doctors Novy, Dock and I spent some anxious days in caring for this patient who

fortunately recovered. This, so far as I know, is the only case of laboratory infection with this bacillus which has ended in recovery. The details of this case have been published.

The relation between the State Board of Health and the Hygienic Laboratory of the University of Michigan was abruptly broken in the first decade of the present century. It happened in this wise. Health officers and others who sent samples of suspected water and food were charged $10 for each examination—to cover expenses. Some failed to remit promptly. It was my custom to report by telegram when a bad water was found. About the time mentioned, the secretary of the university, a village tradesman, selected by the Regents to manage the finances of the university and incidentally to dictate to professors, instructed me not to report on my findings until the fee had been paid. Thus, if typhoid was epidemic in a city and the health officer sent me samples from several sources and I found one or more infected I could not report until the said health officer had remitted to the said secretary. Naturally the disease did not wait while these transactions were in progress. I was shocked by the instructions received from the secretary and immediately conspired with my fellow members on the Board of Health in securing an appropriation for a laboratory at Lansing, where the analyses are now made and reports are sent without awaiting remittances. In fact the Board of Health now has a branch laboratory in the Northern Peninsula. I would like to say more about this secretary but I am restrained by the old Latin proverb which may be translated thus: "Say nothing about the dead unless it be good."

The hygienic laboratory of the University of Michigan continues its work in studying the causation of disease and in giving instruction to students under the wise directorship of Dr. Novy, whose valuable contributions are well known to the scientific world. The examination of samples of water, food and other infected material on the request of health officers has been transferred to laboratories conducted by the State Board of Health, the efficient state health commissioner, Dr. Olin, doing his work most creditably. Possibly my instructions from the secretary of the university, so odious to me at the time, have resulted not so badly after all, since the laboratory at Ann Arbor has been relieved of routine work and given more time for research.

RESOLUTIONS

The Faculty of the Medical School of the University of Michigan

WHEREAS, after the lapse of nearly a decade death has again claimed an emeritus member of this Faculty, Victor Clarence Vaughan, who for forty-six years was an active teacher in this school and who for thirty years was its Dean.

Eminent as a teacher, investigator, and administrator, he rendered most valuable service as a pioneer in the cause and progress of medical education and preventive medicine. He made many notable contributions to science. As an administrator he was conspicuous for his broadmindedness and justness. While insistent upon original productivity, he always accorded academic freedom to his colleagues.

Resolved, That the Faculty of the School of Medicine of the University of Michigan hereby express their realization of the great loss sustained in the passing of Victor Clarence Vaughan and their deepest appreciation of the services he rendered to the Medical School and to the University.

Resolved, further, That a copy of these resolutions be spread upon the minutes of the Faculty and that an engrossed copy be sent to the family.

F. G. Novy,
G. Carl Huber,
A. S. Warthin.

January 6, 1930.

The Research Club

Ann Arbor

WHEREAS, the Research Club of the University of Michigan has learned with profound sorrow of the death of one of its founder members, Professor Victor C. Vaughan, who was, during the first four years of the Club's history, its honored president; and whereas he maintained for the Club throughout the remainder of his lifetime an undiminished interest in its welfare.

Therefore, be it resolved that the Club herewith expresses its deep sense of the loss which it has sustained through his death, and furthermore, that this expression of his fellow members be entered upon the minutes, and that a copy of this resolution be transmitted to his family.

Preston E. James,
Secretary.

Ann Arbor, Michigan,
December 3, 1929.

The Scientific Club

Ann Arbor

MEETING year after year, informally, as we do, we are like a large family, and it is a grief to have one of our members taken from us. Doctor Vaughan was one of the founders of the Club, and to him it owes much of its unique character. Throughout his residence in Ann Arbor he was a faithful attendant at the meetings, and the papers which he read were not only instructive, but suggestive and stimulating. In the discussions he revealed breadth of knowledge and interest in subjects far removed from his chosen field of work. But it was in the "Angang" that his geniality, his keen sense of humor, his idealism, his strength of character showed themselves most clearly. It was a delight to listen to him. Every member of the Club felt that Vaughan was his friend, one to whom he could go for sound advice and for sympathy in time of trouble. He was so human, so simple of bearing, that it was hard for us to think of him as a great man, and yet we knew that his students, colleagues, his many friends, the University, the City, the State, the Country, had all been helped and strengthened by his devoted service. Much that he accomplished was made possible by the tender care of an ideal helpmate, for whom all of us who know her have an affectionate regard.

To her and to the family, we of the Scientific Club extend our sincere sympathy.

The National Tuberculosis Association

RESOLVED, That the Board of Directors of the National Tuberculosis Association hereby records its high esteem of the many contributions of Dr. Victor C. Vaughan, deceased, to the campaign against tuberculosis in the United States and more particularly to the National Tuberculosis Association. As a pioneer in the field of public health, as a teacher and administrator and as a student particularly in bacteriology, chemistry and related subjects, Dr. Vaughan was of great service to the tuberculosis movement. His assistance during the World War in developing cordial relations between the National Tuberculosis Association and other agencies was of great value.

As President of the National Tuberculosis Association in 1919, he rendered signal service. His work in the development of the Michigan Tuberculosis Association and in the furtherance of that organization's work in the early days went far toward making the tuberculosis program in that State a success; be it further

Resolved, That a copy of this resolution be sent to the family of Dr. Vaughan and others who might be interested in receiving it.

January 25, 1930.

The New York Academy of Medicine

DR. VICTOR C. VAUGHAN, an Honorary Fellow of the New York Academy of Medicine, died on November 21, 1929. Dr. Vaughan was widely known in the United States as a chemist, pathologist, epidemiologist and hygienist. He was for over forty-five years connected with the Medical School of the University of Michigan, having worked in the Departments of Chemistry, Physiology, Therapeutics and Hygiene.

An indefatigable worker in the laboratory, he published in the earlier days of chemistry important textbooks on physiologic chemistry and proteins.

In the field of epidemiology, Dr. Vaughan's study of typhoid fever in the American Army camps during the Spanish-American War was a remarkable example of painstaking inquiry, which exposed the woeful lack of hygiene then existing in the American Army. This remarkable investigation, made in association with Reed and Shakespeare, paved the way toward the important reorganization of the methods employed by the Medical Corps of the Army, which produced such remarkable results during the Great War.

During a period of fifty years of active life, Dr. Vaughan was chemist, physiologist, pathologist, epidemiologist, teacher, soldier, scholar and scientist. He was a constant advisor in the fields of medical education, public health and preventive medicine, much beloved by his students and associates, and recognized throughout the United States and abroad as well, as one of the most prominent scientists in the medical profession. Be it therefore,

Resolved, That the New York Academy of Medicine hereby records its deep sense of loss in the death of Dr. Victor C. Vaughan, an Honorary Fellow of this Institution, whose services to humanity have been of enormous benefit and whose example will always be inspiring to those engaged in the relief of suffering and the prevention of disease, and be it further,

Resolved, That a copy of this Minute and Resolution be published in the Bulletin of the Academy and sent to the members of his family.

December 5, 1929.

Dr. Victor Clarence Vaughan
1851-1929

Presented to the Academy of Medicine
Richmond, Virginia, May 13, 1930

TO HIS ancestry and to his earliest environment Doctor Victor Clarence Vaughan attributed those qualities in his personality and in his character which fitted him for his life-work. The blood of pioneers was in him. His forbears had lived in Virginia and in North Carolina in the early days. They were plain, honest, industrious, courageous folk, unafraid of the rough ways of frontier life. Of such ancestry he was born on the twenty-seventh day of October, 1851, in the State of Missouri. That state was then peopled by frontiersmen and its civilization at that time must have been that of pioneer life.

While still a child he became acquainted with the horrors of warfare as the contending armies of the Civil War rolled back and forth across that border settlement. The poverty of the reconstruction period made exceedingly difficult the acquisition of an education. But in spite of hard conditions he completed the academic course in a college in his native state. In this college he then taught Latin to others, and at the same time chemistry to himself. He pursued postgraduate work in the University of Michigan which led to the degree of Doctor of Philosophy. While still a student in this University he became a member of its teaching staff, and at the same time a matriculate in the department of medicine, and in 1878 he was graduated as a Doctor of Medicine. From that date until his resignation in 1921 as dean of the department of medicine Doctor Vaughan was continuously a member of the faculty of the University of Michigan. Although he was actively engaged in teaching from the time he reached adulthood until he was more than seventy years of age, he was essentially an investigator engaged in clearing away medical ignorance and mysticism; and he was aggressive always in his efforts to enable the practitioner of medicine to be a scientist. He did not permit his interest in other activities to prevent him from engaging actively in the practice of medicine. In this respect he set a good example for all those interested in research work.

The medical philosophy of Doctor Vaughan was simple and direct. He believed that sickness is due largely to the introduction of poisonous substances into the body. If the introduction of such poisons could be prevented or their toxic effect upon the body neutralized the human race would be healthier and individual death would be deferred. In consequence of such an attitude Doctor Vaughan early in life became interested in the toxic effect of certain chemicals, and his subsequent medical philosophy was but a broadening of that simple conception. As a young physician and teacher he was not only enormously interested in the new germ theory of disease but he went

abroad for study, acquired all the knowledge that could be gotten in the laboratories of Europe about the living microscopic causes of disease, and he promptly equipped at the University of Michigan probably the first bacteriologic laboratory in the United States. In that University he taught not only bacteriology, but in succession histology, materia medica and therapeutics, and public hygiene and sanitation. He gave to medicine modern toxicology and the basic factors in public health work. For about forty years Doctor Vaughan was president of the State Board of Health of Michigan. In that capacity he gave fully to the welfare of the people of the state the benefits of his great industry and learning. For thirty years he was dean of the Medical Department of the University of Michigan. There he not only taught scientific medicine, but he instantly assumed leadership in this field, and his zeal and his ability to sense developing genius in others enabled him to bring into that faculty the most alert minds in this country. Consequently the school of medicine of the University of Michigan became one of the leading medical schools in the world. Probably no other school in the United States has given inspiration and sound training to so many medical teachers.

Doctor Vaughan was born soon after the close of the Mexican War. He was an actual participant in the Civil War, the Spanish-American War, and the World War. In the border state of Missouri neighbors were divided against neighbors, and as a boy he experienced all the physical and spiritual suffering of border warfare. He served as a medical officer throughout the war with Spain. During that brief but tragic clash he ministered to the wounded and the dying under fire, and only a little later he all but succumbed to an attack of yellow fever. With Shakespeare and Walter Reed he served on a Commission to investigate the ravages of typhoid fever amongst the soldiers of the United States army. The practical disappearance of that disease is due largely to the knowledge acquired by that Commission. The deaths of Reed and Shakespeare placed upon Doctor Vaughan the labor and the responsibility of formulating that voluminous and historic work. Doctor Vaughan had prophetic knowledge of our eventual participation in the World War, and he gave himself freely as a commissioned medical officer in that great struggle. Although he had reached the age of almost seventy years it is to be doubted if any other physician rendered more effective service during that period. Yet he hated warfare, and military trappings and the pedestalization afforded by rank made no appeal to him. It is said that toward the end of the World War he declined to accept a proffered promotion to the rank of Brigadier-General.

Few medical men have made more helpful contributions to medical literature than Doctor Vaughan. He believed in giving the benefit of the newest medical knowledge to all the people through the ministrations of the family doctor and the activities of public health organizations. His volumes, half a score of them, occupy positions of helpfulness in every well-stocked medical library. And he must have contributed almost 200 theses and monographs to sound medical thought. He was the first editor of *Hygeia*. After his retirement from the deanship he published his autobiography—*A Doc-*

tor's Memories. American literature does not afford a more appealing, delightful, and informative account of a brave, useful, and unselfish life than that of this energetic and versatile physician.

He was interested in organized medical effort only as an agency in behalf of human welfare, and he occupied high office in most of the national organizations, but he thought in terms of disapproval of medical politics, and he never sought position for himself.

Doctor Vaughan was blessed in his home life. In 1877 he was married in Missouri to Dora Catherine Taylor, whom he had known since their childhood. Of the five sons, four became physicians; all enlisted for service in the World War, and one of the sons gave his life to his country. After his retirement from active work, Doctor Vaughan came to Richmond to spend his last days near his son, Dr. Warren T. Vaughan, a member of this Academy. We honored ourselves by inviting Doctor Vaughan into honorary membership in this body. No more distinguished physician has ever lived in the Commonwealth of Virginia. His sudden death on November 21, 1929, was preceded for some time by considerable impairment of health, but his vigorous mind never became inactive and his splendid courage suffered no abatement.

It is to be doubted if Doctor Vaughan would have laid claim to the possession of any spark of genius. He was an advocate of simple living, intellectual honesty, unwearied industry, and public service. The poor, obscure, industrious, courageous Missouri country lad made of himself one of the great physicians of the world, and one of the most beneficent servants of mankind. His career should be an incentive to all aspiring youth. And to the ageing his latter days should serve as a good example. The quality of greatness was in his attitudes and upon his achievements in the domain of medicine there is the impress of immortality. But he looked upon himself only as an humble coworker with the Creator of the Universe.

Respectfully submitted,

Dean B. Cole.
C. C. Coleman.
Stuart N. Michaux.
Jas. H. Smith.
Jas. K. Hall.

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